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The Application of Sulphur Colors to Raw Cotton*

Advantages of Raw Stock Dyeing—Principle of Adsorption—Problem of Wetting Out—Application of Sulphur Colors—A Colloid Phenomenon—Testing the Shade—Adsorption as Related to Even Dyeing—Knowledge of Dyestuffs Essential—Shade Matching and Other Troubles

By H. M. CHASE

Chemist and Dyer, Riverside and Dan River Cotton Mills

IN presenting to you the following paper on the application of sulphur colors to raw cotton, I shall avoid a recital of specific formulas for dyeing and try to show the underlying principles involved, calling your attention to a few of the phenomena and problems with which the practical dyer is confronted and the effect of their interpretation and solution upon his results.

The fact that he is dealing with raw cotton instead of the manufactured article has fully as much influence on these problems as the class of dyestuffs used. He therefore should be familiar with the principles of raw cotton dyeing in general, of which I will first give a brief outline.

The dyeing of raw cotton—that is to say, cotton in the loose condition before it is manufactured into yarn or cloth—offers certain advantages. If first spun into yarn it must be converted into special forms, such as warps, skeins, etc., solely for the purpose of handling, and then be reconverted after dyeing. It is true that yarn is frequently dyed in some one of the forms in which it normally occurs in the course of manufacture, such as beams, tubes, cops, etc., methods which are very efficient and growing in popularity. Nevertheless, they require extremely careful supervision, and errors in uniformity of shade once made cannot easily be corrected, while variations in dyed raw cotton are ordinarily absorbed by the mixing of numerous batches. Furthermore, mixed wool-like effects, mock twists, novelty yarns, etc., can be obtained by blending different shades. In general, the process of manufacture is considerably simplified and, as a rule, is less expensive.

This is, of course, predicated upon the assumption that the raw cotton is otherwise identical in its physical characteristics with undyed white cotton. The extent to which this assumption is realized is an exact measure of the value of the process.

Principle of Adsorption in Cotton Dyeing

All cotton dyeing is based upon one general principle: the adsorption or incorporation into the fiber of a substance which is itself colored, or which by subsequent treatment produces a colored body which satisfactorily resists removal under ordinary conditions.

In raw cotton dyeing the physical state of aggregation of the coloring matter has everything to do with the value of the results. Any method of dyeing which seriously affects the physical properties of the fiber will naturally interfere with the delicate processes of carding and spinning which have been adapted through years of patient trial and error to handle the fiber in its natural smooth, pliable condition. If, for example, a coarsely dispersed colored precipitate, such as the aluminum lake of alizarine (Alizarine Red), is produced in and on the fiber, the pliability and smoothness of the latter are destroyed and it is absolutely unsuitable for spinning. The stiff rough fibers break, acquired an electric charge in their friction with the fine steel teeth of the card clothing (which makes them absolutely unmanageable), refuse to slip evenly one upon the other in the drawing processes, and generally reduce production and quality to a minimum.

In this connection I would call your attention to a

*Paper presented before the Dye Division of the American Chemical Society at Richmond, Va., April 11-15, 1927.

very interesting fact. With a few individual exceptions, those cotton dyestuffs which as a class exhibit the greatest fastness to washing produce the greatest physical change in the fiber; furthermore, their methods of application would lead one to suspect a coarser state of aggregation within it. To make a crude comparison, a very finely divided mud would have less effect upon the velvety softness of a sponge than a coarse sand—and be more easily removed by washing. The discovery of a class of cotton dyestuffs which would be adsorbed by the fiber in a nearly molecular state of dispersion and at the same time be fast to washing and other agencies would mark an epoch in the industry.

Problem of Wetting Out Stock

The early attempts to dye raw cotton were crude and resulted in far more damage to the fiber by handling than was contributed by the dyestuff itself. Anyone who has tried to submerge a piece of loose cotton in water and wet it thoroughly will appreciate the problem presented by a mass of 500 pounds of it floating about on a tub of dye solution and resisting the strenuous efforts of several workmen endeavoring to push it under the surface with poles and make it stay there. By the time the operation was completed the loose fluffy material was reduced to a mass of so-called "rag-tails."

The cause of its fractious behavior in this respect was ordinarily attributed to the natural oil contained in the fiber which resisted wetting. Even to-day this notion persists, and various penetrating oils and chemicals are used as wetting-out agents. The true explanation is the presence of adsorbed and entrained air. A bale of cotton has been known to remain under water for months and still be dry inside. If cotton is packed in a vertical closed cylinder with a false bottom and an opening below it, and steam introduced gently above the cotton, the hot steam floats on the cold air and quietly pushes it downward, taking its place. If, as soon as steam appears at the bottom opening, water or dye solution, either cold or hot, is introduced, the cotton will be perfectly and entirely wetted. If, instead of steam, cold water or dye solution is introduced at the bottom under a slight pressure, the rising level of the liquid will push the air before it and again the cotton is perfectly wetted. This latter method is the one usually employed in modern practice.

Very little raw cotton was dyed prior to the discovery of the so-called direct coal-tar dyestuffs. It would appear that these dyestuffs exist within the fiber in such a finely dispersed condition as to approach solution, and as their relation by weight to the cotton seldom exceeds 5 per cent the physical effect on the latter is slight. With these dyestuffs and improvements in methods of handling, the dyeing of raw cotton became so strongly entrenched that the dyer has been successively called upon to produce the same spinnable fiber with first the sulphur colors, then the vat colors, and finally even the naphthol colors, despite the fact that these three classes of dyestuffs tend in the order named to produce in the fiber a greater and greater physical change, the last-named, or naphthol, colors being to all intents and purposes an actual precipitate within the fiber.

Application of Sulphur Dyes

Now, while the direct colors are adsorbed from a simple water solution and may be expected to undergo in the fiber certainly no chemical change, and probably very little physical change, the sulphur dyestuffs must first be reduced by means of an alkaline reducing agent, usually sodium sulphide. The resulting so-called leuco product is soluble in water and acts precisely like a direct color. Heat and the addition of neutral salts accelerate the adsorption just as in the case of the direct color, and it is apparently held by the fiber with about the same tenacity. On exposure of the dyeing to the air, however, the original dyestuff is regenerated by oxidation and thereby fixed more firmly. It is, in fact, now in the nature of an insoluble precipitate.

To the practical dyer a sulphur dyestuff is one which is normally applied to cotton in the above manner. In fact, this is the sole distinguishing characteristic of the group, the individual members being produced, as a rule, from various unrelated organic compounds by fusion with sulphur or alkaline sulphides, and consequently having no definite chemical relation with one another. In many cases they are undoubtedly mixtures of several different products.

As every careful dyer submits his materials to a laboratory examination before using, a brief description of his laboratory methods will enable me to point out at the same time those characteristics which are of importance in the application.

Naturally, the laboratory examination consists mostly of small-scale dyeings designed to reproduce as exactly as possible the operations of the dyehouse proper.

Small porcelain dye pots containing 10 grams of cotton and 200 to 250 c.c. of water, with the desired percentage of dyestuffs and chemicals, constitute the dye bath. The source of heat may be a water bath charged with common salt, nitrate of soda or glycerin.

A Colloid Phenomenon

If the dyestuff in question is tested for its solubility in water, a very interesting fact may be observed While most sulphur dyestuffs are insoluble in water, some are partially soluble and some are entirely soluble, the solution presenting no visible difference from

that of a direct color. But while the direct color would be rapidly adsorbed by cotton under the influence of heat, with perhaps the addition of a little common salt, the soluble sulphur dyestuff refuses to leave its water solution for the cotton under the same conditions. If, however, a little sodium sulphide is added, the adsorption is as rapid as in the case of the direct color. Furthermore, if the cotton is now exposed to the air and the dyestuff presumably oxidized to its original condition, it now refuses to leave the cotton for the water, even when boiled in soap solution. I submit this as of considerable interest to the colloid chemist.

The next step is to determine the amount of sodium sulphide required by a series of comparative dyeings. In all cases the dyestuff, usually 5 per cent of the weight of the cotton, is dissolved by heating in five to twenty times its weight of water with the sodium sulphide and usually a small quantity of soda ash. The amount of sulphide will be found to vary from one-quarter of the weight of the dyestuff to twice its weight. The soda ash should be approximately one-half the weight of the sulphide, its chief function being to supply the alkalinity gradually lost by the sodium sulphide in the mechanical agitation of the dye bath. Unless hard water is used the soda ash may be reduced in amount or omitted altogether, as modern dyeing apparatus involves very little agitation of the dye bath. One or two dyeings should also be made with a large excess of sulphide to determine its effect.

The solution of dyestuff is added to the dye bath; the cotton, previously wet out in soluble oil or under the tap, is entered and the whole heated to boiling as rapidly as convenient. At the end of thirty minutes 4 to 6 grams of common salt are added and the boiling continued thirty minutes longer. The cotton is then removed, squeezed in an ordinary wringer, exposed to the air a few minutes, rinsed by hand under the cold-water tap, squeezed again and dried for examination.

From this series of dyeings we find not only the amount of sulphide required but also the action of an excess which is sometimes injurious and sometimes not.

Next we determine in similar fashion the best temperature for dyeing, and by removing a small sample of each dyeing just before adding the salt we observe whether the adsorption is slow and requires the acceleration always induced by salt or whether it is fast and needs little or no salt.

Testing the Shade

Having thus found the very best method of dyeing, we should treat a finished sample with 1 per cent of its weight of sodium perborate at a boil. Any change in shade or appearance indicates that a similar change will take place gradually on standing by progressive oxidation, unless artificial oxidation is employed in the beginning—a very important feature to bear in mind.

Finally, the usual tests for fastness to washing, bleaching, light, acids, etc., are made and the results tabulated for future reference.

The large-scale operation is comparatively simple. The dyestuff is dissolved by boiling with five to twenty times its weight of water containing the proper amount of sodium sulphide and soda ash. This solution is added to the dye bath containing the cotton, the bath is heated to the proper temperature, a neutral salt, common salt or Glauber salt is added, if necessary, and the operation continued for the time found requisite.

Adsorption as Related to Even Dyeing

The cotton is usually packed tightly in a tank or machine and the dye solution circulated through it. At the end of the operation the dye solution is turned out to the drain or in some cases pumped to a reservoir for use in the next dyeing, as it still contains considerable useful dyestuff and chemicals. But the cotton in the machine holds back several times its weight of solution. If we remove the cotton and expose it to the air, the regenerated dyestuff will be reformed not only in the fiber but also in the interstices of the entire sponge-like mass. This regenerated or precipitated dyestuff will cause the fiber to be rough and unspinnable. Obviously we must remove this extraneous dye solution. Simple washing with cold water usually answers the purpose if the leuco dyestuff is fast to washing. In some cases, however, the leuco dyestuff resembles reduced Indigo and has poor affinity for the fiber. Probably 20 per cent of it will be removed. In this case we must wash as lightly as possible and suffer an appreciable loss of dyestuff, or else add the first washings to the reservoir and use it for the next dyeing. If the dyeing machine is of the closed type and of substantial construction, the excess dye solution may be blown out with compressed air which serves at the same time to oxidize the leuco product within the fiber. This is a very logical improvement used in some modern apparatus. In any event, a final rinsing with cold or warm water, or if necessary a treatment with sodium perborate before rinsing, completes the operation.

Some of the problems encountered are as follows:

Assuming that the cotton is held stationary and the dye solution circulated through it from bottom to top, we perhaps find that the bottom of the load is dyed a deeper shade than the top. The top may even be white. Evidently the speed of adsorption is high compared to the movement of the solution as a whole through the cotton. The rate of circulation is fixed by the design of the apparatus. We must therefore in some way retard the rate of adsorption. Fortunately, this rate of adsorption varies in practically all sulphur

dyestuffs directly with the temperature; also, at any given temperature the rate is increased by the addition of neutral salts and varies directly with the amount added. We therefore correct this difficulty by starting the dyeing cold, gradually raising the temperature to the degree at which the dyestuff is best applied, and then gradually add the salt a little at a time or use no salt at all. The remedy is practically infallible. In extreme cases we may add common glue solution at the very beginning, which further retards adsorption.

Again, we may be dealing with a dyestuff which has a slow rate of adsorption; so slow, in fact, that a considerable quantity of salt is required to force it into the fiber. The circulation suddenly slows down and channels are formed between the load and the sides of the machine through which the dye solution is forced violently. On completing our dyeing, we find a dark scum or precipitate on the bottom. The addition of salt was undoubtedly necessary and the amount not excessive, but the addition should have been made more gradually, starting with a small amount and increasing the successive additions.

The action of neutral salts is interesting and peculiar. Equal quantities of the general run of dry neutral salts of sodium or potassium have practically the same effect, regardless of their molecular weight. The addition of a moderate amount—say, 3 to 5 grams per liter of dye solution—accelerates the adsorption. As the adsorption continues, the concentration of the dyestuff becoming less, a further addition of salt speeds it up again, and so on. No precipitation takes place whatever with a high concentration of dyestuff and a low concentration of salt, or with a low concentration of dyestuff and a high concentration of salt—that is to say, 50 to even 100 grams per liter. With a high concentration of both, precipitation may take place and give rise to the difficulty mentioned above.

Knowledge of Dyestuffs Essential

Again, we may wish to produce an olive shade; for example, with a mixture of an orange-brown and a black. Everything proceeds apparently satisfactorily, but on removing the load of cotton we find it to be orange-brown tinged with black on the bottom and black or gray tinged with orange-brown on the top. Evidently we have here two dyestuffs with different rates of adsorption. To remedy this we may retard the adsorption to suit the brown until it is well adsorbed, and then accelerate it by raising the temperature or adding salt to suit the black. If we have a mixture of three or more colors, the complication increases; but by knowing the properties of each and making proper use of our means of retardation and acceleration, practically perfect results can be obtained. Obviously we should have a complete knowledge of the properties of each dyestuff and, if possible, select for our mixtures those having similar properties.

The rate of adsorption is also affected by the concentration of the dye bath and by the ratio of its volume to the weight of the cotton. For this reason it is not advisable to purchase mixed dyestuffs to match a given shade unless the standardization is made under exactly the same conditions as those of the practical dyeing, which is seldom the case. The different rate of adsorption will naturally produce a different shade, which can only be corrected by having the component dyestuffs at hand; so it is much better to purchase them separately in the beginning.

Difficulties of this nature may actually occur in the case of a single dyestuff owing to variations in the manufacturing conditions and the inherent tendency of a sulphur dyestuff to contain several different products. A dyestuff carefully standardized in the works laboratory with the addition of, say, 5 grams of salt per liter may turn out weaker or stronger than previous lots when dyed in the practical way with 30 grams of salt per liter.

Shade Matching and Other Troubles

One more peculiarity of these dyestuffs may be mentioned. It is certainly very disconcerting to the dyer, when matching a dyeing made several weeks previous, to find that exactly the same percentage of dyestuffs and chemicals applied in exactly the same way produces an entirely different shade. This is usually due to progressive oxidation or aging of the first dyeing on standing. The shade has become brighter, clearer and of a different tone, perhaps yellower or greener. A treatment of the last dyeing with sodium perborate closely imitates this aging and usually solves the problem. With an exact knowledge of the properties of the dyestuffs used, he would have perborated the first dyeing to its permanent color.

Finally, after the dyed cotton is hydro-extracted, dried and safely delivered to the mill, one might reasonably suppose that the dyer's troubles are at an end. But a visit to the card room often shows that they have only begun. His carefully handled cotton has acquired an electric charge in its passage through the cards. The tenuous web of fibers waves about as if animated and is attracted by and sticks to every object in its vicinity.

This difficulty is often overcome by an ingenious electric device called a neutralizer. The source of the trouble is either lack of moisture or roughness of the fiber. To prevent it, the dyed cotton should be stored in a moist atmosphere for some time before using until it has acquired is natural regain of 6 to 7 per cent of moisture. Treatment with common salt or Glauber salt in the last rinse is often effective, and in recent years a fine spray of water or emulsified oil on the dry cotton has proved of value.

An evenly dyed, well-washed product, a uniform moisture content, constant humidity in the card room, with perhaps a light, well-regulated oil treatment, constitutes about the best set of conditions and usually enables sulphur-dyed raw stock to hold its own with white cotton.

The Toronto Chemical Association was recently formed at Toronto, Canada, for the purpose of taking a major part in the dissemination of chemical knowledge as applied to the textile and other industries. Douglas Hallam, secretary of the Canadian Woolen and Knit Goods Manufacturers' Association, is a member of the Executive Committee. W. A. Schorman is chairman, and the committee includes several other well-known textile men.

The Purpose and Practice of Souring

Part I

What Sour Is and How It Acts—Its Effect on Textiles—Change in Feel of Cloth—Temperature and Other Conditions—Operations After Sour

By F. H. GUERNSEY

Chief Chemist, Cowles Detergent Company

A "SOUR" is a chemical having an acid reaction, and is the chemical opposite of an "alkali." Another is as follows: A "sour" or acid is a substance containing hydrogen which it easily exchanges in chemical reaction. The easier the exchange of hydrogen, the stronger and more destructive the acid.

Hydroxyl ion is to alkali what hydrogen is to acid.

Acids are characterized by a "sour" or sharp taste, and the German term for an acid is "sauer." These facts are probably responsible for the adoption of the practical term "sour" in the laundering and textile industries, though other designations (as "pickle" in metal industries) are also applied to this group of chemicals in other industries. The expression has even been stretched to include some materials which are neutral in reaction, but which have a capacity for absorbing alkali efficiently.

The action of sours is quite dependent upon the extent of a chemical change known as hydrolytic dissociation of the acid in water. This means that the chemical elements making up the sour must break apart (dissociate) when the sour is dissolved in water. One element of this split is always hydrogen, and the strength of this hydrogen ion yield has thus come to be a measure of the strength of the acid or sour. In so far as plain neutralization of alkali is concerned, the hydrolysis is not so important, but when it comes to attacking stains, lime deposits, etc., an acid which shows appreciable hydrolysis, or ease of breaking up, is the more efficient.

The acids which hydrolyze considerably are known as strong acids, and those which do not hydrolyze to a great extent are recognized as weak acids. One encounters the same objections, however, in connection with these strong acids as is observed when dealing with the caustic alkalies; i. e., they are too destructive to the fabric being washed.

How Sour Acts

1. *In Alkali Neutralization.*—The prime function of a sour is that of neutralizing alkali.

Uncontrolled alkalies which remain unneutralized will change the color of a normal white cotton or linen fiber which has been subjected to strong bleaching and thus converted partially to oxycellulose from white to yellow, and even dissolve the oxycellulose to form a yellow solution. These two conditions mean discoloration, and loss of substance from each fiber with a resulting loss in strength and wearing qualities.

It very often happens that the water being used for washing and rinsing is alkaline in reaction, and under the heat of the iron becomes sufficiently strong to damage and discolor the fabric. This is a common condition in zeolite softened water and many raw waters. Judicious souring will prevent evils that would otherwise result from this condition.

2. *In Stain Removal and Prevention.*—Some staining materials will dissolve in an acid solution but not in an alkaline solution. In rounding out the washing formula, a sour is used to prevent such stains remaining in the finished work.

If the water contains a small trace of iron, and is also alkaline as just described above, the residual alkali will change the iron over to the very visible red oxide form, or in other words show a rust stain. If the last rinse water is properly soured, this appearance of iron may be entirely avoided, or at least greatly reduced.

Grayness, due to the deposit of lime soap or other lime compounds, may be prevented and any accumulations greatly reduced by employing a sour to decompose the deposited materials and permit their removal by rinsing and neutralization.

Iron stains, originating from a natural contamination in the water supply, or from corrosion in pipe lines, may only be cleared away with a proper sour.

3. *In Bleaching.*—Stain removing is in one sense a bleaching action, but some sours, aside from this, will exert either an oxidizing or reducing action which will result in a general whitening of the goods. The general

bleaching qualities of various sours are discussed later in this article with the properties of individual sours.

4. *In Decomposition of Chlorine Bleach.*—Sours are employed to destroy the alkaline chlorine bleaches after the bleaching bath. This serves to reduce the number of rinses required in net washing and heavy goods. The destructiveness of any carried-over bleach is thereby avoided. At the moment of neutralization, hypochlorous acid is generated and its intense bleaching action is felt for an instant. This practice therefore results destructively when any considerable amount of bleach is so neutralized. A piece badly stained may usually be whitened by immediate transfer from oxalic sour to chlorine bleach, but only at terrific loss to the goods.

5. *In Fixation of Blue.*—The bluing operation is essentially a staining or tinting problem, rather than one of dyeing. Yet many blues are too slow or too fast in going onto the fabric, or do not go on evenly. The so-called basic blues perform better in an acid medium and therefore a sour is frequently used to level the distribution of the color and take-up.

Some of the sours have a peculiar action upon cotton, in that they increase the affinity of that fiber for the basic colors. The sour, therefore, aids the tinting process materially.

Hard water and alkali are detrimental to many blues and a sour will automatically correct these detrimental influences.

How Sours Affect Textiles

The effect of sours upon the various fibers is of utmost importance. Many of the stronger acids will attack the fiber to form weak hydrocellulose and oxycellulose compounds.

Some of the sours attack the fiber and cling through rinses. The "acid patches" thus formed are destructive and troublesome.

Some of the sours affect the fiber so as to increase its affinity for certain dyes. This brings out a difference in bluing results when various sours are used.

The highly crystalline sours filter into the fiber interior, and rinse slowly. Certain of them, if retained in the goods, will prove destructive in ironing. If neutralized by alkali, the salts produced will exert an abrasive action upon the fiber interior.

Some of the sours form acid salts under practical souring conditions and these salts are nearly as destructive as the acids themselves.

Some of the sours will produce a "scroop," or squeak like that of new leather, in the cotton fiber, particularly if allowed to remain in the goods upon drying.

The stronger acids which attack cellulose ("cellulose" is the technical word for cotton and linen fiber), rapidly form a compound with it called hydrocellulose, and in some cases the more familiar compound called oxycellulose is formed also.

Hydrocellulose is very similar to oxycellulose in many respects, particularly in that it is friable, that is without structure, is soluble in alkali and forms a yellow discoloration with alkali. Like oxycellulose it is acid in reaction and has stronger reducing power. These two cellulose derivatives may finally degenerate or change into glucose or sugar.

Why the Feel of Cloth Often Changes

It is important to note that repeated action of destructive acids and uncontrolled alkalies will change the appearance and feel of a given fabric.

The excellent appearance of most new fabrics is to a large extent due to the reflection of light from the surface of smooth fibers. This condition is further enhanced by the use of starch sizing. But with this removed from a standard fabric the smooth, glistening effect of the fibers is still very noticeable.

Hydrocellulose produced by acid, and oxycellulose produced by overbleaching and raw alkalies, eat into the fiber surface and are then dissolved out by subsequent treatment with an alkali solution. This leaves the fiber surface in a roughened condition, changing materially its appearance under light. Instead of *reflecting* light, it will *absorb* considerable of it and give a dull gray appearance.

For this reason it is not always possible to restore the appearance of fabric which has been allowed to get into this condition, even though all the dirt is removed by later proper washing methods.

The luster of silk is due to the smoothness of the fiber. To give the wool fiber (which has small scales upon its surface) a luster, it is necessary to oil it with a suitable oil to produce a continuous film, hiding the broken surface of the fiber caused by the scales.

Where to Sour

In wash wheel work, the souring operation should be inserted in the formula at a point where it is certain that all of the soap has been rinsed away or soap specks will be produced. This is necessary because of the troubles caused by the products of chemical reaction between sour and soap. Chief among these is rancidity, and staining caused by deposit of the fatty acid in the goods upon its release from the alkali (in soap) by the acid. Be extremely cautious therefore never to add sour till all soap is out of the load.

To obtain a working concentration or strength without excessive consumption of sour, a low water level is used for the souring operation. About the same level as used in the suds operation is employed.

Temperature and Other Conditions

Since higher temperatures greatly increase the hydrogen ion content of a solution of sour, and hence its destructiveness and other activity, this factor (heat) must be kept under control.

(*Continued on page* 328)

Proceedings of the American Association of Textile Chemists and Colorists

The American Association of Textile Chemists and Colorists

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APRIL MEETING OF THE PIEDMONT SECTION

The April meeting of the Piedmont Section of the American Association of Textile Chemists and Colorists was held at the Poinsett Hotel, Greenville, S. C., on Saturday, April 16, 1927. There were sixty-eight members present at the dinner and 100 members present at the meeting that followed.

Prof. C. S. Doggett was unanimously elected chairman to succeed Leonard S. Little, whose business activities have taken him from this section of the country. Professor Doggett accepted the honor conferred upon him with a few appropriate remarks.

Mr. Gregg, of Stonecutter Mills, was unanimously elected vice-chairman to succeed Professor Doggett. Mr. Gregg was not present at the meeting.

It was decided to hold the summer meeting in Asheville, N. C., some time during July, and motion was made by Harry Ormand that we invite the new Southern Section to meet with us, inasmuch as Asheville is centrally located for both sections. It was suggested by Mr. Hood, of Union Bleachery, that we invite Professor Olney to attend this joint meeting. A vote was taken and the suggestion accepted.

Motion was made by Mr. Thompson, of Rohm & Haas Company, that the secretary write Mr. Little a letter wishing him success and happiness in his new surroundings. This was voted upon and passed.

The following papers were presented:

"Ira Remsen, His Life and Works," by Prof. Charles S. Doggett.

"Bleaching of Cotton Piece Goods," by H. W. Ormand, of Union Bleachery.

"Multi-Colored Effects on Multi-Fibered Hosiery," by H. Grady Miller, of Elliott Knitting Mills, Inc.

"Package Dyeing in Closed Machines," by W. W. Puckett, of Southern Franklin Process Company.

These four papers are published below.

Unlike previous meetings of the Piedmont Section, there was a lively discussion following each paper. Many questions and answers were made regarding the papers presented.

DYER MOSS, *Secretary.*

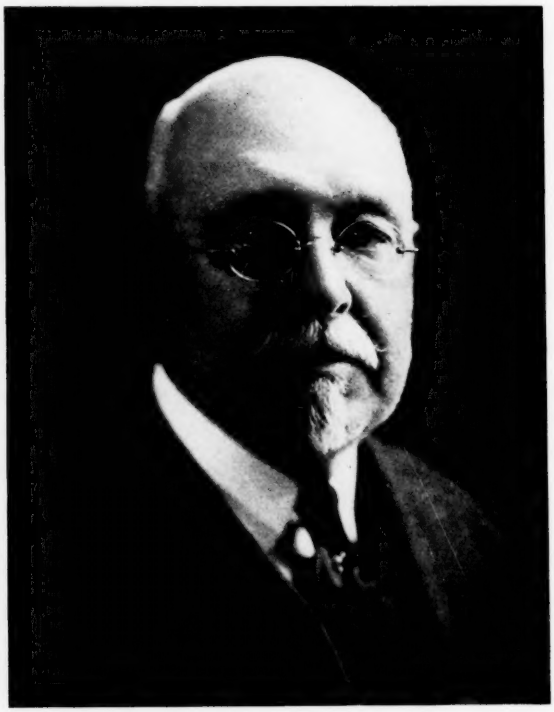
Ira Remsen—His Life and Works

By PROF. CHARLES S. DOGGETT

Remsen, one of the great chemists and teachers of the world, was born in New York City on February 10, 1846, and died in California on March 4, 1927. His father was descended from the early Dutch settlers of Long Island, his mother from early Dutch settlers and French Huguenots. Her grandfather was pastor of a Dutch Reformed Church, and Remsen spent part of his childhood in this home where both Dutch and English were spoken. The atmosphere in this home was a deeply religious one, and

Remsen had read the Bible several times by the time he was twelve years of age.

When Remsen was eight years old his father, who was a merchant, bought a farm in Rockland County, New York, hoping that there his wife's health might improve.



Dr. Ira Remsen

The family spent two years on the farm, and after the mother's death returned to New York.

Remsen received a slight smattering of knowledge in rural schools, and then attended a public school in the city. When he was fourteen years old he enrolled in the Free Academy, now the College of the City of New York, where, with the exception of history, Remsen excelled in all subjects, especially in mathematics. He also took a great liking to Latin and Greek. A course of lectures given once a week by Dr. Ogden Doremus on anatomy, physiology, geology, astronomy, etc., was the only introduction to the sciences which Remsen had.

A Medical Student

Remsen did not graduate from the Free Academy. His father had decided that he should study medicine, for which the lad had no aptitude; but in those days children obeyed their parents. Accordingly, Remsen was apprenticed to a medical man who taught chemistry in the homeopathic medical college, and who evidently gave the boy but a homeopathic dose of chemistry, handing him a work on that subject to read.

Feeling that he should go to a medical school of better reputation, Remsen entered the College of Physicians and Surgeons of Columbia University, from which he graduated as doctor of medicine at the age of twenty-one. The subject for his thesis was "Fatty Degeneration of the Liver." In addressing the Medical Faculty of Maryland in 1878, Remsen referred to this thesis as follows:

"Eleven years ago, in company with ninety-nine others, I was proclaimed fit to enter upon the career of a medical man. My erudition in medical matters was exhibited in a thesis on the 'Fatty Degeneration of the Liver,' a subject on which I was and am profoundly ignorant. I had in fact never seen a liver which had undergone fatty degeneration, nor a patient who possessed, or was supposed to possess, one; nor, I may add, have I had that pleasure up to this day."

Upon graduation his professor offered him a partnership in his lucrative practice; "but aside from any repugnance in going forth to kill when he could do that but clumsily, he really did not like medicine at all." At this early age Remsen must have known himself well, and persuaded his father to sanction his desire to follow chemistry as his life work.

His Work in Germany

At this time there were no great chemical laboratories in this country. Liebig was the great chemist of Germany, with but one rival, Wohler. So in the summer of 1867 Remsen went to Munich to become a student of Liebig. At this time Liebig gave a lecture course in inorganic chemistry, and, as he no longer received students, he turned the young foreigner over to the most promising *privat-docent* in his laboratory, who happened to be Volhard, one of the best laboratory manipulators of the day. Remsen also attended Liebig's course of lectures.

He spent two semesters in Munich. At the end of the year, Volhard advised him to go to a larger laboratory, and suggested Gottingen where Wohler was professor. Wohler happened to be visiting his old friend, Liebig, in Munich, and there Remsen met him and found in him a friend from the start.

At Gottingen Remsen worked directly under Fittig, in due time becoming a research worker under him. Early in 1870 he received the doctor's degree, and was about to return home when Fittig received a call to Tubingen and suggested that Remsen should accompany him there as an assistant. Remsen gladly assented and remained for two years in Tubingen, acting as lecturer and laboratory assistant, and utilizing his spare time in

carrying on investigations of his own. While he was in Tubingen he made the acquaintance of William Ramsay, who had come there as a student, and very soon the two became great chums.

In 1872 Remsen returned to the United States, after having spent nearly five years in Germany. He was now a university man, appreciated university life, and could conduct research. At this time, however, he had no opening in view. While seeking in vain he completed a translation of "Organische Chemie," by Wohler, which he had begun in Tubingen.

At Williams College

After some months of fruitless searching, offers came to him almost simultaneously from the University of Georgia and Williams College. The latter he accepted as professor of physics and chemistry. He found that there was no laboratory at Williams College. A mild request for one received the following answer from the president: "You will please keep in mind that this is a college and not a technical school. The students who come here are not to be trained as chemists or geologists or physicists. They are to be taught the great fundamental truth of all sciences. The object aimed at is culture, not practical knowledge." At the end of the year, however, the board of trustees did build a small laboratory for his own use. Remsen spent four years at Williams, and while there published a book on "Theoretical Chemistry." "The novel method of presentation, the systematic arrangement, a rare clearness and simplicity in style, afforded it a welcome among all scientific workers. It passed through five editions, and was translated into German and Russian."

At this point allow me to inject a personal item. When I went abroad to study chemistry this book of Remsen's was the only one I remember taking with me. Early in this book the unusual word *markedly* appears and is repeated from time to time through it, and also in a later work of his, namely, his "Organic Chemistry." My personal acquaintance with Remsen, using chemical language, is but a mere "trace." At a meeting of the Organic Section of the American Chemical Society a few years ago, an elderly gentleman arose and made a few remarks. In about the second sentence the word *markedly* came out, and I could feel tingling through me, "Hello, that's Remsen." And so it was. Later on Remsen wrote a number of books on inorganic and organic chemistry and on other subjects, and, undoubtedly, the word *markedly* frequently appears in them. These books were markedly successful. The "Organic Chemistry" has run through a number of editions and is perhaps the best introductory work of its kind in existence.

After four years at Williams, Remsen, at the age of thirty, was appointed to form a nucleus of promising scholars, who later made Johns Hopkins illustrious throughout the world. Emphasis was to be placed on advanced graduate work, the professors were expected to do research, and the necessary facilities were to be provided to the extent that money could provide them. The only advice that President Gilman had to offer was: "Do your best work and do it in your own way."

Teacher and Research Worker at Johns Hopkins

From this time on until he was appointed president of Johns Hopkins University in 1901, Remsen's series of researches were carried on without a break. At this period, the results of his researches were sent to the American Journal of Science, but soon they grew to such proportions that the editor of the paper was frightened, as his paper had been devoted to general science articles. This led Remsen, in 1879, to start the American Chemical Journal, of which he was editor for thirty-five years. After that time the Journal of the American Chemical Society came to the front and Remsen thought that his journal had served its purpose and it was discontinued.

During the absence of President Gilman in Europe in 1889-1890, Remsen served as acting president of Johns Hopkins, and in 1901, when President Gilman retired from office, he was elected as Gilman's successor. This office he held with marked distinction until 1912 when he resigned. His wish to spend more time in research was one of his important reasons for retiring from the presidency. This is reflected in his words: "The transformation from university president to chemist is complete, and I rejoice."

Several attempts to induce Remsen to leave Baltimore for other and more lucrative positions proved futile. He remained true to Johns Hopkins. "This is my berth for life," he said in an address to the students.

Remsen's influence upon chemical research in the capacities of writer, investigator and editor has been no greater than his influence as a teacher. "As a teacher of many other teachers, his influence, direct and remote, has been and will continue to be of incalculable value to American students of chemistry." At Johns Hopkins Remsen was extremely popular because, in addition to sound scholarship, he had so much of the milk of human kindness; he forgave much.

In Public Service

Remsen's public work was along several lines and was of great value. At the request of the National Board of Health of Baltimore, Remsen, in 1881 undertook an in-

vestigation into the organic matter in the air, and a study of the impurities in the air of rooms heated by hot air furnaces and by stoves. Similar work was done for Boston, and also work on their water supply. The impurities he found to be due to the growth of fresh water sponges in an artificial lake recently formed to give a more adequate supply of water. In 1884 Remsen served on a committee appointed to investigate the glucose industry of the United States. Another committee upon which he served dealt with the question of the processes employed in denaturing alcohol.

In 1909 President Roosevelt appointed Remsen chairman of a board of consulting scientific experts to aid the Secretary of Agriculture in matters pertaining to the administration of the pure food law.

About this time Remsen had a controversy with Dr. Wiley over the use of benzoate of soda as a preservative of foods. He proved that Wiley was wrong in condemning this substance; that it had no serious effects when used even in much larger amounts than those upon which Wiley based his conclusions.

Remsen also served as one of the board of trustees of the City Hospital of Baltimore.

Honored and Distinguished

Remsen received many honors during his life time. The LL.D was conferred upon him by Columbia in 1893; Princeton, 1896; Yale, 1901; Toronto, 1902; Harvard, 1909; and Pennsylvania, 1910. In 1898 he was elected a Foreign Fellow of the London Chemical Society, and in 1911 a Foreign Member of the French Chemical Society. In 1902 he was elected to the presidency of the American Chemical Society, and in the following year to that of the American Association for the Advancement of Science.

From 1907-1913 Remsen was president of the National Academy of Sciences—the highest American scientific distinction. In 1908 he was awarded the Gold Medal of the Society of Chemical Industry (England), and two years later became its president. In 1914 he received the Willard Gibbs Medal of the Chicago Section of the American Chemical Society.

In 1923 Remsen received the first Priestley Medal to be awarded. Remsen was chosen for his achievements in research; his contributions to the linking of chemistry with medicine; his efforts toward the organization of the famous department of chemistry at Johns Hopkins (sometimes referred to as the turning point in the science in the United States); the editing of the American Journal of Chemistry, and, greatest of all, the inspiration Remsen was to the men whom he trained. As soon as a student proved his interest in the work and showed proper comprehension of what it meant, reverence and affection began to grow together. It has been said concerning the awarding of the Priestley Medal: "It is well that the medal should go to so great a teacher, so eminent a man of science, and withal so distinguished a gentleman and scholar."

Bleaching of Cotton Piece Goods*

By H. W. Ormond
Union Bleachery, Greenville, S. C.

The bleaching of cotton piece goods is too large a subject to be covered even in a general way by a short paper, as there are many kinds of piece goods which require special bleaching processes and several different methods of bleaching in common use. For these reasons this paper will be confined to the bleaching of all cotton gray goods which are to be finished either into white or colors. Therefore, we will be interested in the chlorine bleach.

Taking up the various processes in order we find first those preliminary processes which have to do with opening the bales of gray cloth, laying the cuts out and sewing the ends together so as to make a continuous strand of cloth. Next the cloth is run through a singeing machine where the type of finish requires that a clean surface be given to the cloth. If this is not necessary the cloth is passed through a suitable machine for wetting out the gray goods. The wetting out operation is the first step towards removing the sizing from the gray goods. In some plants it is customary to allow the gray goods to steep overnight after being wet out in warm water; such an operation causes the size to ferment there by making the size easier to wash out.

Another practice is to wet out the gray goods with a warm solution of malt which is capable of converting the starch in the size into a soluble form. A shorter and cheaper method suitable for certain fabrics is to wet out through hot water and steep about ten minutes in a Gantt Piler. The purpose of these different methods is the same, namely to put the size into such a state that it can be more readily washed out. After wetting out and steeping, the cloth is washed and given a gray sour; that is, passed through a very dilute solution of sulphuric acid, squeezed and steeped for a few minutes and washed to remove the acid.

The treatment with sulphuric acid not only aids the removal of sizing but it also enables you to secure a clearer and brighter white after bleaching. This opera-

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tion is usually referred to as the gray sour. I would like to emphasize these preliminary processes because close application of these principles prepares the cloth well for boiling.

What the Kier Piler Does

The next operation brings us to the kier. Generally speaking, there has been but little development of bleaching and finishing machinery within the past few years. However, the kier piler is one exception. This machine plaits the cloth into the kier in a uniform manner. Before we had this machine a boy or man plaited the cloth into the kier. Whenever mistakes are made and results desired are not obtained you often hear the whole trouble laid to "the human element." While this expression is often overworked the old method of knocking the cloth into the kier by hand had with it, all too often for the bleacher's happiness, much of the "human element."

As regards materials used in the boil, a certain percentage of caustic soda is the one prime requisite. When bleaching heavy fabrics or closely woven goods it is often well to add some soap. As regards the various assistants for giving a softer, thicker feel and all of that, the results obtained in many cases is only a higher cost.

The duration of the boil depends upon the type of heating and circulating system, the construction of the goods being boiled, and upon local conditions. For these reasons you will find plants boiling from 10 and 12 to 14 hours, or even boiling twice.

Advantages of Chlorine as Chemic

After the boil the goods should be well washed while in the kier, certainly to the extent that the wash water comes through clear. Following the wash, the goods are pulled out through a washer, squeezed and run through chemic. Until recent years chemic consisted of a solution of bleaching powder, but bleaching powder has been supplanted in most places now by liquid chlorine; that is, liquid chlorine dissolved in an alkaline solution. Some of the advantages of chemic made from liquid chlorine are as follows:

1. The available chlorine content is more uniform.,
2. A clear solution is always produced.
3. All of the ingredients are soluble.
4. There is no danger of lime spots, and the possibility of resist therefrom. As to the strength of the chemic, this depends upon the type of fabric being bleached, how well the goods have been boiled, and upon the length of time the chemic is to be allowed to stay in the goods.

After the cloth has been made white from the action of chemic upon it, the next operation is the removal of the chemic from the goods. Different plants use different methods to accomplish this work. After washing the goods well through a washer, some plants give a white sour in very much the same manner as the gray sour, except perhaps an even weaker solution of sulphuric acid is used. There are several good reasons for a white sour, among which is that certain stains in the goods, developed during the boil, are removed by such treatment. Light rust and lime stains can be removed by a white sour provided the cloth is steeped long enough. Also you will find that when off shade cotton has been used in the manufacture of piece goods, such cloth is often given a brighter white when white-soured. At the present time quite a bit of such cotton is being made into piece goods, and for this reason it is well to keep the white sour in mind. However, don't understand from this that off-shade cotton can be bleached into as bright a white as good cotton simply by souring.

The Bleacher Has His Troubles

Another method employed for removing the chemic is to wash the goods and then pass through water containing SO_2 gas. This solution neutralizes any chemic left in the cloth after the wash. These operations complete the bleaching process.

Before closing it might not be amiss to mention a few troubles which affect the bleaching of piece goods. I would like first to call your attention to those originating during the processes as just outlined and, second, troubles originating at the gray mill.

About the worst thing which can happen in a bleach house is to tender a lot of goods. I am not here to-night to open the closet door and parade all of the bleacher's family skeletons, as it were, but by facing these troubles and understanding the cause, we then can exercise the necessary control to prevent them. Any condition during the boiling of piece goods with caustic soda which permits air or free oxygen to come in contact with the goods will cause the cloth to become tender. Too strong or too long a treatment with chemic accomplishes the same result. Cloth treated with even a very dilute solution of sulphuric acid, if allowed to dry, will cause tendering. These three conditions are the chief causes of tender cloth.

Rust and lime stains from the kier come from not coating the walls of the kier frequently enough with whitewash or not properly applying or drying the whitewash.

Unbleached, moaty spots are produced by faulty boiling. There are many conditions which produce faulty boiling, some of which are uneven distribution of cloth in the kier, thereby causing the liquor while circulating to miss certain parts of the goods. This condition is often spoken of as channelling. Sometimes a kier chain breaks on one side and produces the same condition. Un-

even steam pressure on a kier equipped with the steam injector circulating system causes poor boiling. Many of these troubles can be overcome by using a kier piler which will distribute the cloth evenly throughout the kier, and by using the pump and heater type of circulation on the kier.

Locating Reel Marks

Another bleach house trouble and one the dyer is interested in, we might refer to as bruised places or reel marks. This, as the name indicates, refers to places where the surface of the cloth has been bruised or scratched up. A record should be kept which would show the various machines and reels through and over which each lot passes. In this way you are often able to find the apparatus responsible for such trouble. Often it is well to determine the speed of the cloth and reels, as a rough reel running faster than the cloth is sure to cause trouble later in dyeing.

In reference to troubles originating in gray mills, I would like to mention a few in the hope that the mills will co-operate with finishing plants to the mutual advantage of both.

A great many mills wash out oil spots, or so treat the oil that such spots are removed during the boil. There are two dangers in such practice: The goods might be dyed in the gray, in which case such treated places will dye much heavier, and, second, if these places are not dried or disinfected mildew will set up. A gray mill should be informed through the sales agent whenever goods are to be dyed in the gray. Furthermore, damp goods should never be baled until dry.

Rust Spots

Another practice which often produces trouble is the treatment of rust spots with an acid, such as oxalic acid. Unless the acid is thoroughly neutralized, each place so treated will become extremely tender on singeing.

Some plants mark defective weave places by stitching in a colored thread on selvedge at such places. Later the goods are baled and often a few of these colored threads are left in the goods, and being stitched in the selvedge go on into the kier. After boiling, colored places are found in the goods. One string only a few inches long can easily mark off in a dozen or so places.

Hanging threads, thin weave places, spliced pieces and injurious chemicals used in singeing might be mentioned, but no doubt enough has been said to show the need of a better understanding between the gray mill and finishing plant. The industry is not altogether backward in realizing this need and many agencies are furthering the good work. It is in this spirit that these remarks are offered you.

Multi-Colored Effects on Multi-Fibered Hosiery*

By H. Grady Miller
Elliott Knitting Mills, Inc., Hickory, N. C.

In my talk I do not propose to give you any new or scientific information as to the production of fancy multi-colored effects on multi-fibered hosiery, but I am going to talk to you in dyer's terms and I propose to tell you here just how we are producing multi-colored effects at the Elliott Knitting Mills.

There are many ways of producing multi-colored multi-fibered effects on fancy hosiery by combining dyed yarns and the many different rayons, each made by a special chemical process and having different affinities for dyestuffs: Celanese, wool, silk and cotton. There is practically no limit to the fancy colored effects that can be produced by using these many different yarns dyed or undyed, although each shade and pattern is a problem in itself with which the dyer has to become familiar.

Dyeing Process for Fancy Hose

In dyeing our fancy hose number, each batch is given special attention in every operation that it is to go through while in the dyehouse. We make sure that each dozen lot is thoroughly "opened up" and loosened up so that none will be compact or crowded in the dye bath, as this will tend to cause uneven dyeing by our method. Our next operation is to put the goods in the dye tub for coloring. In dyeing the fancy number we use as long a bath as is possible. Before the goods are entered into the liquor in the tub, we add about 3 per cent Orthocen G and bring the temperature up to about 100 deg. Fahr., revolving the dye cylinder for a few times so as to thoroughly mix the Orthocen with the water. At this temperature we loosen up the goods again as they are entered into the dye tub. The hose are worked in this wetting-out liquor for about five minutes; then, without further heat or a raise in temperature in the tub, the dyestuff is added, which has been previously boiled up in a three-gallon Monel bucket. Three gallons of the dye liquor are added to the tub in quart quantities on the downward, or forward, motion of the dye tub cylinder. After the dye has been added, we run the tub for five minutes without further steam, then we raise the temperature very slowly to 120 deg. Fahr. At this temperature we stop the tub and see if the goods appear to be dyeing evenly.

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and if not, we loosen them again as sometimes the goods that are in the center tend to dye uneven; after this operation we raise the temperature very slowly to 160 deg. Fahr. in about ten minutes and then cut off the steam. For the remainder of the dyeing operation, we let the steam "coast downward," for there is no need of more steam for the colors that have been used. You will also note that we are dyeing in the wetting-out bath and that we are using colors that exhaust without the addition of salts. We let the tub run for two minutes at 160 deg. Fahr., and then take a sample for comparison with the standard. We have found that this will allow about three minutes' more time for the goods to be worked at this temperature, which, in all, gives them about five minutes at 160 deg. Fahr. After many runs and tests we have found that this is the correct time to run our goods to get the desired shade and to have the batch dyed evenly. On no occasion, up to the present time, have we found it necessary to run the tub longer or to make further additions to the dye bath to match our standard shade.

The remaining operations, for finishing this fancy number, are few and simple. After running off the dye liquor, the goods are given one good rinse in cold water; then they are extracted and sent to the boarding room.

Precautions in Color Selection

We have managed to keep our shades on this fancy number down to three, namely, champagne, French tan and light gray, all light shades, which I have here for your inspection. You will notice that we have only a small part to do in the dyehouse to complete the multicolored effect in this style of our fancy number, that is, to dye the top, heel and toe and to wet out the goods for the boarding room. In examining this fancy number, it can readily be seen that colors have to be selected that will exhaust evenly and at a low temperature. Next, care must be taken so as not to "bleed" any of the knitted pattern, and the rayon effect must be kept clear in the finishing touches. We have found that higher temperatures will cause the knitted patterns to fade into the top, heel and toe, and also color the rayon, thereby throwing our shade considerably off from the standard; consequently, one can readily see that the temperature has to be controlled perfectly because the goods are wetted out and dyed at the same time. We have had our troubles in dyeing this fancy number, but we think that we have practically overcome most of them at this time.

If higher temperatures are to be resorted to where colored yarns are used in the knitted pattern, then it will be found advantageous to employ the use of vat-dyed yarns or thoroughly soaped sulphur colors, and if the silk effect is to be kept white or cross dyed, then the use of Celanese for the silk effect will be found very successful, as this yarn will stand a temperature of 180 deg. Fahr. without very many of the direct colors having any affinity for it, especially in a soft bath. We have found that Sulphur Blues and Browns bleed very much at high temperatures with our dyeing method for fancy hosiery, and another strong objection to their use when dyeing just under the boil, or at 180 deg. Fahr., is this: The color that bleeds off tends to combine with the fatty acid of the wetting out assistant and any iron or magnesium that may be present in the water, and in turn this scum causes spots on the hose that are very difficult to remove.

Shade Formulas

I have a hose here, a French tan shade, dyed in a soft bath at 180 deg. Fahr. with Benzo Fast Brown RL. The white silk effect in this pattern is Celanese, which you will see is left practically clear. In this pattern, as in the other patterns which I have for your inspection, you will notice that the dyed yarns are all heavy shades. When heavy shades are used in the pattern, then it is not a hard job to dye a light mode shade on the top, heel and toe. Light shades can be used in the pattern, but such yarns have to be resisted or they will change considerably in the dye bath.

In producing the shade of champagne which I have here, the following colors were used for 100 pounds of goods:

235 grains Erie Brown 3GN
141 grains Erie Orange Y
47 grains Erie Orange A
47 grains Direct Fast Yellow NN

For the French tan per 100 pounds of goods:

840 grains Erie Brown 3GN
465 grains Erie Orange A
327 grains Diazine Black DR
12 grains Erie Orange Y
12 grains Erie Cardinal 7B

For the light gray, per 100 pounds of goods:

1320 grains Trianol Direct Fast Grey G

After many experiments we have chosen these colors because they exhaust at a medium speed, not too slow nor too fast; and because these colors dye evenly at a low temperature without the addition of salt. These colors are used in our wetting-out bath, which is to our advantage because it reduces handling the goods, and these colors, in a soft bath at a low temperature, seem to leave the rayon silk effect unstained.

We have a few redyes on this fancy number, sometimes two or three dozen pairs out of a 180-dozen run that dyed

a bit uneven. We have, in every instance, touched up these goods so that they would go as "firsts" in the following manner: We prepare a bath with about 2 per cent Orthocen G and raise the temperature to 160 deg. Fahr. The goods are entered at this temperature and run for about fifteen minutes with the steam cut off. We have found that this method levels our goods perfectly.

My subject is "Multi-Colored Effects on Multi-Fibered Hosiery," and I have, therefore, not included solid, or union shades on many-fibered hose, such as mercerized cotton, rayon and silk. I might say, though, briefly, that the mode shades can be produced on these fibers in most instances by using union colors, with the exception of cordovan, rose taupe, gunmetal, navy blue, etc. Each of these last-mentioned shades requires special dyes and special dyeing methods, under mill conditions, to produce a good union on all the fibers.

Package Dyeing in Closed Machines*

By W. W. Puckett
Southern Franklin Process Company

Dyeing yarn on packages in closed machines has several distinct advantages. One of these is versatility. Either small or large batches can be handled readily. Even a small dyehouse can be designed to handle various sized lots, as machines can be obtained to dye one-pound samples up to one thousand pounds and over. The pressure method insures thorough penetration of all counts and twists of yarn. Even dyeings are obtained as the dye liquor is continually pumped through the package, alternating in either direction by means of a control valve.

Several fundamental facts must be observed in order to obtain the best results. (1) It is essential that the packages be uniformly wound, that is, not hard so that the dye solution meets with too great resistance, nor too soft so that chanelling results. Packages with hard ends and loosely wound centers are to be avoided, as the dye solution follows the line of least resistance and uneven dyeing results. A properly wound package has equal tension throughout. (2) The loading on the spindles in the machine should be done uniformly, the same number of packages being placed on each spindle. (3) The water supply should be clear of dirt and foreign matter and softened if necessary, as it is impractical to try to correct the water in the machine, and (4) it is necessary to bring into proper solution all dyestuffs and assistants before entering the machine. By observing these precautions, uneven dyeing and filtration on the package is reduced to the minimum. The concentrated dye bath is still another feature, as low steam and water consumption and better exhaustion of the dyestuff is obtained. This is especially advantageous in the dyeing of the vat colors, due to their high cost.

Vat Colors in the Package Machine

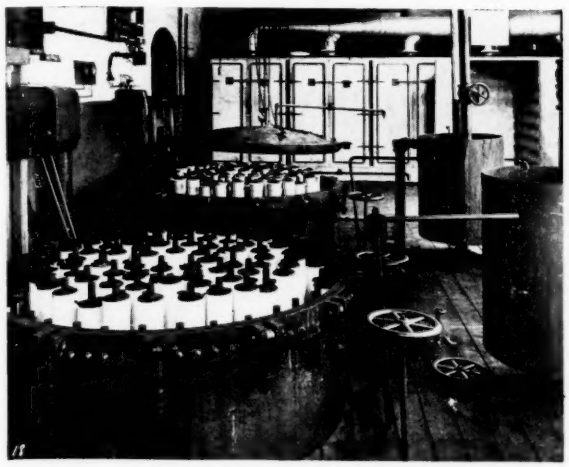
The enclosed type machine is ideal for dyeing vat colors. The yarn is kept in the reduced vat throughout the entire dyeing operation, only a small part of the dye bath being exposed to the air. This, of course, eliminates premature oxidation.

For a long time it has been the general rule to boil out yarn with Turkey Red oil and soda ash prior to dyeing vat colors. This softens up the waxes and gets the cotton thoroughly wet out and in a state for dyeing. It has been found that this boiling out, with its loss of time, steam and water, can be eliminated by the use of certain solvent mixtures which work in a cold or lukewarm bath at practically the same cost of materials. Such mixtures as neutral castor oil soap or sulphonated castor oil with Hexalin and Tetralin, or soap and commercial pine oil have the property of wetting out at a temperature of 100 deg. Fahr. to 120 deg. Fahr. One-half to 1 per cent of such mixtures will thoroughly wet out. Their efficiency lies in their ability to remove the naturally occurring free fat and waxes in the cotton as well as any mineral oil acquired in carding and spinning, etc. These agents also aid the penetration, as the dyeing may be carried out in the wetting-out bath.

The vats whose reduction and dyeing temperature is the same (as the majority of the true anthraquinones are) may be reduced right in the expansion tank after stopping the pump. The general procedure is as follows: After adding the soap and solvent mixture and bringing the temperature to, say, 120 deg. Fahr., and running for a few minutes, the pump is stopped and the caustic and sodium hydrosulphite is stirred into the expansion tank. Then the pasted dyestuff, along with about ½ per cent of soluble oil, is added and stirred for five to fifteen minutes when reduction is generally complete. The pump is then started and dyeing commences with the dye liquor pumping from the inside for five minutes, the valve reversed and the liquor pumped from the outside—in for five minutes, and so on. The so-called cold reducing and cold dyeing vats are also handled in this manner.

There are, however, some exceptions to this general method. Some of the "Indigoid" types require a much higher temperature for reduction than for dyeing. For instance, Hydron Pink FB or Ciba Blue 2B. This type is best reduced in barrels at their proper reducing temperature, say 160 to 180 deg. Fahr., and added to the machine at their proper dyeing temperature, say 120 to

*Presented at the meeting of the Piedmont Section of the American Association of Textile Chemists and Colorists, Greenville, S. C., April 16.



Franklin Package Machines Loaded and Ready to Close for Dyeing.

140 deg. Fahr. Another exception is the dyeing of mercerized yarn. In this case it is advisable to start the dyeing at a low temperature, say 95 deg. Fahr., employing in the dye bath 1 to 2 per cent glue or goulac to retard too rapid dyeing. After about twenty minutes the temperature is slowly raised to 140 to 150 deg. Fahr. and run at this temperature for about thirty minutes to insure penetration.

By means of the sampling device a small skein of yarn which has been wrapped around one of the packages can be taken from the dye bath, oxidized and soaped in the beaker and matched against the standard. If the addition is needed it can be made at this time, and if the batch is on shade it is ready to be oxidized and developed. Oxidation is best carried out by the use of 1 to 2 per cent of perborate of soda, circulating for about twenty minutes at 100 deg. Fahr. The soap may then be added to the perborate bath and the temperature brought to 200 deg. Fahr. After soaping for twenty to thirty minutes the yarn is washed and a reeling taken. In most instances the reeling from the package checks very closely with the sample skein taken from the dye bath. In order to insure this it is important that the sample from the dye bath be given a slightly alkaline boiling soaping in the beaker so that the fully developed shade is obtained. This applies especially to colors and certain combinations which change their shades radically on soaping. Greens dyed with Indanthrene Blue and Yellow are characteristic, becoming bluer as the temperature of the soaping is raised, finally reaching their true shade after boiling with soda ash.

The length of time required for loading, dyeing and finishing a 1,000-pound machine where no addition is necessary is about four and one-half hours.

Direct Colors in the Package Dyeing Process

Ability to obtain good matches, good penetration and level dyeing are features of the closed package machine for dyeing direct colors. With the exception of tints and very light bright shades which require a bleached bottom, the yarn does not need to be boiled out before dyeing. The general operation consists of bringing the dissolved dyestuff along with 1 per cent of soluble oil to 200 deg. Fahr., running for thirty minutes, then salting. On light shades, and more especially on mercerized yarn, it is advisable to employ Glauber salt, while on medium and dark shades common salt may be used. The expansion tank makes an automatic slow feeding device for the salt. After salting about thirty minutes is allowed for exhaustion, then a sample is taken and matched against the standard. If it is necessary to make an addition of dyestuff, it can be dissolved and added directly to the machine. On medium and dark shades on cotton yarn almost any color may be added. For the purpose of shading at the boil on mercerized yarn, as well as on light shades on cotton, good leveling colors should be selected. A complete range of these are to be had. Colors of the type of Chrysophenine, Blue 2GL, Sky Blue 6B, Red 8BLN, Pontamine Black LN, Chlorantine Brown 3GL and Chlorantine Violet 4BL can be added to even fairly light shades on mercerized yarn at the boil. If upon examination of the sample the batch is found to be on shade, it may be given a cold salt rinse, using about 5 per cent of common salt. It is given another wash to clear the salt and is then ready to be unloaded.

Sulphur Colors and Their Difficulties

Sulphur colors are generally conceded to be the most difficult to control in all types of apparatus. Several facts make this more or less a reality. Poor exhaustion of some of the colors make their control complicated. Insoluble matter such as metallic sulphides in the commercial sodium sulphide employed, as well as in the dyestuff itself, sometimes caused filtration on the package. The complication of bringing some of them into good solution is still another difficulty. These troubles can best be overcome by carefully selecting good leveling and exhausting colors and combinations. Also by diligently watching the dissolving, taking care that the solution of dyestuff, sulphide and soda ash is boiled until thoroughly soluble. It is also essential that the dissolved dyestuff be strained through a cloth before entering the machine.

In the dyeing of medium and heavy shades of oxidizing navy blues, it is helpful to give a lukewarm sodium sulphide wash immediately after dyeing and before oxidizing. Perborate of soda seems to be the best oxidizing agent. The light sky blues are best dyed at as low a tem-

perature as is consistent with level dyeing, say 120 to 150 deg. Fahr. Glauber salt is recommended here instead of common salt. Enough sodium sulphide should be employed to keep the dyestuff thoroughly soluble and reduced throughout the dyeing operation, without having too great an excess. This has to be determined by experience, as no general rule will work with all the colors.

In a job dyeing plant where the dyer is called upon to match an almost unlimited number of shades, it is impractical to employ standing baths except of Sulphur Black. In dyeing Sulphur Black, the machine is filled with the storage liquor, brought to 200 deg. Fahr., and the calculated amount of dyestuff, sodium sulphide and soda ash previously dissolved is added. In the course of forty minutes to one hour a sample is taken from the dye bath and washed and soaped in the beaker. At the same time the hot bath is tested with a Twaddell hydrometer. When the hot dye bath registers over 5 deg. Tw. no salt is generally added, but when under 5 deg. Tw., 5 to 10 per cent common salt is added. The match of the sample swatch from the dye bath also influences the dyer's judgment on the amount of salt needed to get the depth of shade desired. After dyeing it is advantageous to give a warm 2 per cent sodium wash to remove surplus dye not held in the fiber. All sulphur colors should have a final soaping at 200 deg. Fahr.

Miscellaneous Colors, Naphthols, Etc.

The comparatively recent introduction of several new Naphthols of the Naphthol AS series which possess good substantive dyeing properties make certain of this class of dyestuffs particularly applicable in the package machine. Naphthol AS/SW coupled with Fast Red KB Base makes a very fast red which will withstand the bleaching and finishing operations commonly given ginghams and shirtings, etc. This Naphthol with Fast Red GL Base or Fast Red GLA Salt gives a very good wine shade. Naphthol AS/BR also works well in the machine. These substantive dyeing naphthols can be applied in a bath of caustic soda and soluble oil at 120 deg. Fahr., and later washed in an alkaline salt bath to remove any surface naphthol. This rinse eliminates crocking after coupling with the diazotized base, or the prepared soluble salt of the base. It is possible to obtain quite a range of shades by combining the different bases or salts with the various naphthols or combinations of naphthols.

The developed colors are also readily applied in the closed package machine, the dyeing being carried out in the same manner as for the directs, followed by the diazotizing bath and later coupling with the desired developer, and finally soaped at the boil.

It is impossible in a paper of this kind to go very much into detail, and I have simply tried to give you some of the main fundamentals of package dyeing in closed machines. If in doing this I have been able to bring out a few of the advantages, I feel that my time has been well spent.

I thank you.

APRIL MEETING OF LOWELL JUNIOR SECTION

The April meeting of the Lowell Textile Junior Section of the American Association of Textile Chemists and Colorists was held at the school on Thursday, April 21, 1927, at 3.30 p. m.

Chairman Meeker opened the meeting, and the secretary's report was read and accepted. Election of officers for the next school year followed.

The new officers are: President, John V. Killheffer; Vice-President, Francis R. Rodalvicz; Secretary-Treasurer, Earl W. McLean.

Alan A. Claflin, of L. B. Fortner Company, the speaker of the afternoon, was then introduced. He read a paper on the subject of "The New Education and an Old Industry," which was appreciated greatly by the assembly. This paper appears below. Upon the completion of his address, Mr. Claflin was given a rising vote of thanks and the meeting adjourned.

B. Glickman, *Secretary.*

The New Education and an Old Industry

By Alan A. Claflin

In choosing for my topic this afternoon a subject of general nature rather than something specific and concrete, I fear I may sacrifice your interest to my personal conviction. However, if you are fairly earnest students of the science of chemistry, and particularly of its application in the textile industry as it is fair to assume from your being here, despite the desultory character of my talk you may pick up sufficient new lines of thought to make your attention worth while.

You know it is gradually being appreciated that the purpose of education is not to teach an accumulation of facts, but to teach people how to think. Nowadays the open mind, the mind alert for fresh impressions—not the possession of a fund of knowledge or store of outworn lore—is the mark of an educated man.

Shortly you will have a commencement. I remember in my youth wondering why the end of an educational course was called commencement. I know now, for it is then the average person begins to think for himself. There is a tendency or point of view, with which I have no patience, that regards a formal education as sort of nickel-in-the-slot proposition; that is, you put in so much time and so many hundreds or maybe thousands of dol-

lars of your parents' money and draw out a degree or diploma, and that the world owes you a living forever after. The possession of this point of view is the cause of those articles or statements coming from this captain of industry or that saying higher education is a failure. An education is never a failure if it teaches one how to think and when to think. Perhaps I should not say when to think, because the answer to that is *always*, but I think you know what I mean: we admire the man who always uses his head, whether it be on the ball field, at the card table or in the dyehouse.

Unfortunately when one begins the study of a science there are so many new facts to acquire it is easy to assume that the absorption of facts is thinking. It may be a form of thought, but it is a very low form. Intrinsically there is no more mentality required in memorizing the atomic weights of the elements, or the structural formula for a number of dyestuffs, than in knowing the batting averages of the same number of ball players or the fighting weights and records of the champion pugilists. There is, however, this tremendous difference: the chemical facts that stay with you will be valuable as solid points or foundations for your superstructure of thought, while the sporting data rapidly outlives its interest, and usefulness it never has.

Not Enough Real Theory

Now if thought is not the accumulation of knowledge, what is it? It is theorizing. When you go out into the work-a-day world, you will be told the trouble with you young chemists is you are all theory or too much theory. The real trouble will be that you have not enough theory, and the reason you will not have enough theory is because erecting a theory is a good deal like erecting a building: its size and extent depends on the area and depths of its foundations. There is, however, this distinction: the engineer of a building makes sure of his foundations before he starts and only builds to their capacity; the constructor of a theory examines his foundations only as his structure begins to totter. Frequently, if not usually, he is the best scientific thinker who erects the biggest structure on the most meager foundation.

The whole science of aromatic organic chemistry rests, or perhaps in the light of present-day knowledge we should say did rest, on what may be termed a lucky guess of Kekule. The great developments of coal-tar color chemistry were brought about by an elaborate theory erected by Prof. Otto Witt on foundations now known to be unexact and inadequate, if not absolutely erroneous.

You have studied chemistry to apply such knowledge as you have acquired of that science and may acquire, in the textile industry, and I trust you will not consider I am disparaging your Alma Mater if I express the hope that the knowledge you may acquire will be vastly greater than that you have acquired. Now you already know that the textile industry is largely a mechanical industry, and so far as the chemist functions in it to-day, it is a minor role. Fortunately for you, however, we are coming to the New Day, the day when there are no dividing lines in science, chemistry, physics, electricity, mechanics—all material sciences are parts of the same whole. All are motion and the degree of restraint is all that matters. With such a broad concept, whether the chemist becomes zoologist and biologist and studies the growth of wool on the sheep's back, or agriculturist and botanist and observes the development of the vegetable fibers, entomologist and studies the silk-worm, or remains a chemist and produces rayon, or whatever department of the utilization of these fibers he devotes himself to, he will still be a chemist if he remembers the mark of an educated man—the open mind.

Color Theories and Colloids

So much for generalizations. But when I become specific I become diffident, because I fear I am a nineteenth century chemist and we are in the second quarter of the twentieth century. Now, wherein can the more modern chemistry be useful in your industry?

There is no immediate probability of one of my early dreams being realized, that of transmitting one color into another by some simple means. Since what we know as colors are merely sensations on the retina produced by vibrations of different intervals, or light of different wave lengths as it is more commonly expressed, it does seem plausible that some simple chemical tuning device might be developed that would permit the fundamental dyestuff molecule to reflect rays of predetermined length. Think how simple the dyer's art would be if one could saturate a fabric with the suppositious substance, activate it by exposing it to the particular light it was desired to reflect, and then make the shade permanent by some mordant or fixative. Modern researches on the relation of the constitution of dyestuffs to the colors produced by them, however, show the problem to be one of extreme complication. The vibrations that produce the sensations of color are not of molecules, or atoms, but of the electrons of atoms whose activities are restrained or influenced first by adjacent electrons of the same atom and these in turn by the contiguous atoms that constitute the molecule.

If, however, the phantasy of one dyestuff for all colors becomes the more unlikely, the more the problem is studied; surely the question of the operation of dyeing deserves study with the expectation or hope that it will become simpler the more it is studied. This is a problem of colloidal chemistry; the fibers themselves must be

classed as colloids, while the dyes may or may not be. Whether one considers colloidal behavior from the purely chemical view of Loeb or the physical aspect with Bancroft, a problem is here on which even the most elementary data are lacking. According to advance reports of a paper Dr. Bancroft is giving at the current meeting of the American Chemical Society, he is to maintain the view that dyeing is purely a phenomena of adsorption because the ratio of dye in solution and the dye adsorbed is a smooth curve. Now I am not entirely sure where is the dividing line, or if there is a clear dividing line between adsorption, selective adsorption and chemical attraction; in fact, it seems more reasonable to me that the distinctions between these phenomena are degrees of magnitude.

However, to come back to Dr. Bancroft's paper, it is of course unfair to criticize it merely from an advance notice, and what I say is in regard to the smooth curve of the dyeing operation; while I have never made any experiments to determine whether the curve is smooth or not, my impression from many years of general observation of dyeing operations is that with many, if not most dyestuffs, there is a distinct saturation point or peak to the curve. This point is probably more pronounced if one considers not only the quality of dye adsorbed or taken up by the fiber, but the tenacity with which such dye is held by the fiber. Dr. Geo. E. Clark, from X-ray observations of dyed fiber, has stated that if there is not a distinctly chemical combination between the dye and the fiber at least there seems to be a definite orientation of the dye molecules around the fiber, and it seems to me a chemical combination can be considered as little more than definite orientation of atoms in relation to other atoms.

Relation of Dye Fastness to Fibers

Is not this definite orientation of the dye the criterion of fastness to washing of a dye? There is some distinction between a color that merely stains a fiber and one that dyes it permanently. There are all degrees to this difference and I believe it will be found in general the faster the dye the sharper the peak of its curve of adsorption.

Interesting studies are indicated by the phenomena that rayons dye heavier shades than cotton, but not heavier than mercerized cotton; that chlorinated wool dyes more brilliant and faster colors than unchlorinated wool. The relative fastness to light of the same color on different fibers—is there a difference and, if so, why? It is easy to account for difference in fastness to washing, for the degree of fastness here is a property of the combination of dye and fiber; but how is a property apparently pertinent only to the dye influenced by its adhesion to a particular fiber?

Textile chemists are just beginning to take cognizance of the value of hydrogen ion determinations in establishing standards for the various operations. The complication and expense of apparatus for such measurements have tended to keep practical workers away from a method that really puts a simple instrument in their hands and a means of duplication of conditions hitherto judged by experience. Indeed, what is most needed is appreciation of the underlying philosophy of what we may term the pH scale, not so much to know how it is derived, but to define degrees of chemical activity rather than chemical quantity which may or may not be reactive. All sorts of tests will be devised by the experienced colorist as indicative of the correct pH range for certain purposes once he begins to observe and classify with this object in view. Among examples that come to mind are the dyeing of carbonized wool, particularly with Sulphon Cyanines and with those fulling colors that are really direct dyes. In fact, even those two extremely important points have not been established on the acid side where cotton is decidedly attacked, and on the alkaline side where wool is. Nor in considering hydrogen ion measurements must it be assumed that the whole theory is more than a working hypothesis furnishing new light and deeper insight to the whys and wherefores of various phenomena, but at the same time subject to unexplained exceptions and abnormalities.

Mathematics vs. Pure Reasoning

Professor Bancroft pointed out last year at the Colloid Symposium at M. I. T. that determinations with the hydrogen electrode under certain conditions do not check at all with measurements based on the rate of inversion of sucrose. An observer of the development of physical and colloidal chemistry cannot but be struck with the tendency to generalize from insufficient data, and it is the duty of the practical worker to be so familiar with modern lines of thought that he can either furnish additional support for new theories, or point out discrepancies. Since most advanced scientific thought is and must be developed mathematically, it should be appreciated that such pure reasoning is prone to accept errors as fact. Clerk Maxwell, one of the most brilliant mathematicians who ever lived, of whom it was said he dreamt in calculus, was notoriously unable to balance a check book, and I believe I have heard that at Harvard they never allow a professor of mathematics to add up a bridge score.

While we have been considering dyeing and the phenomena of adsorption, of practically equal importance to the textile chemist is the converse of this—the question of detergence, cleansing the fibers of extraneous matter, the scouring of wool, the bleaching of cotton, the

degumming of silk—all, it would seem, involve the same problems as the dyeing of these fibers but in the opposite direction. Indeed, so elementary a question as the behavior of different fibers to water, which in the case of the artificial fibers is of much vital importance, has, I believe, been hardly studied at all.

MORAL VALUE OF SCIENTIFIC EDUCATION

It is unnecessary and would be tedious to you to continue to enumerate what appears to me unchartered territory in textile chemistry. When you begin to do practical work the same thoughts and many more will occur to you. One point I would emphasize is that the scale on which you work does not alter chemical or physical laws. As a general rule, large scale work is easier than laboratory work because changes take place more slowly, yet I have seen many young chemists who could think clearly and reason accurately concerning reactions in test tubes and beakers, get rattled and have their minds fail to work at all when confronted with exactly the same problem on an engineering basis, i. e., in the works tank or mill dye vat. How many chemists are satisfied with a statement that things work differently on a big scale, instead of ascertaining that if they do work differently, what conditions have been changed by the size of the operations? Of course, mistakes are more expensive on the large scale, and that is one advantage of large scale experience, it emphasizes the importance of accuracy; but if one is to be a chemist one must learn to be accurate, to be accurate in work and in observations. The great moral value of a scientific education is that one learns to be honest with himself.

I thank you for the attention you have given me and assure you that if you regard the beginning of your practical work as the beginning of your education, if you keep your interest keen, do not hesitate to ask questions, mingle with your fellow chemists, follow the journal literature, have a little scientific library of your own and consult freely the library of your Alma Mater, you will go far in your profession, and, what is more important, lead a happy life.

APRIL MEETING OF THE RHODE ISLAND SECTION

The April meeting of the Rhode Island Section of the American Association of Textile Chemists and Colorists was held jointly with the Rhode Island Section of the American Chemical Society on Friday evening, April 29, in the rooms of the Providence Engineering Society, Providence, R. I.

The meeting was called to order by Dr. Bigelow of Brown University.

The speaker of the evening was Dr. R. E. Rose, director of the technical laboratories of the E. I. du Pont de Nemours & Co., Wilmington, Del. His subject was "The Output of Research."

At the conclusion of the address the speaker was given a rising vote of thanks by the sixty members present.

The meeting adjourned at 9.15 o'clock.

ALBRO N. DANA, *Secretary.*

Applicant for Membership

Active Membership

Woodhead, H. A., vice-president and superintendent, Gregg Dyeing Company, Graniteville, S. C. Sponsors: D. C. Newman and E. P. Davidson.

Changes of Address

Benkert, Arthur L., 828 Bronx River Road, Bronxville, N. Y.

Booth, Herbert, 517 Johnston Building, Charlotte, N. C.

Davis, Mark L., 203 Howell Street, Providence, R. I.

Glennon, Edward M., 212 W. Valentine Street, Westbrook, Maine.

Harrall, Edwin T., 464 Orchard Street, Englewood, N. J.

Hood, George C., 256 Baldwin Street, Lowell, Mass.

Jaeger, Robert W., 20 Oakwood Street, Mattapan, Boston, Mass.

Marsden, W., Box 282A, R. D. 1, Clifton, N. J.

Roberts, Herbert C., 247 Heather Road, Upper Darby, Penn.

Rohm & Haas Company, 222 West Washington Square, Philadelphia, Pa.

Sauerbrey, W. A., 808 Bronx River Road, Bronxville, N. Y.

Sturtevant, Harold B., 398 Morse Avenue, Ridgefield, N. J.

Tarpey, Thomas J., 23 Fremont Street, Winter Hill, Somerville, Mass.

Van Tromp Gover, G., care of A. E. Staley Manufacturing Company, Corn Exchange Building, Manchester, England.

Williams, Charles, Worcester Bleach & Dye Company, Worcester, Mass.

Questionnaire

[NOTE.—The following Questionnaire was mailed to all members of the Association a few weeks ago, and also appeared in the last issue of the Proceedings. It is published here once more for the benefit of new members. Those who have not received a copy by mail or who have misplaced their copy should notify the secretary.]

Remember, if you wish to be considered a member in the best of standing, you will fill out this questionnaire to

the best of your ability, and return it immediately. *Answers to some of these questions are absolutely necessary for the publication of an accurate Year Book.* Even though you cannot answer all the questions, answer as many as you can and mail it to the Secretary as early as possible.

1. Name .....
2. Home Address .....
3. Name of Company or Employer.....
4. Business Address .....
5. Occupation or Official Designation.....
6. Check the headings in which you are particularly interested: Cotton, Wool, Silk, Linen, Artificial Silk, Union Material.
7. What subjects can you suggest which you believe will be of general interest for presentation or discussion at our Annual Meeting, which will be held in New York City during the first week in December?
8. Will you present a paper in regard to one of these subjects, and if so, which one?
9. Are there any special features in regard to the Annual Meeting you would suggest to make it of greater interest and value to the attending members?
10. Look over the 1926 Year Book and suggest any ways in which you believe it might be made of more value to the readers, or any additions which you would suggest for 1927.
11. Make note of any corrections or additions which you believe should be made to the list of American dyes as published in 1926 Year Book.
12. Make any suggestions you may have in mind in regard to the general activities of the Association, including the work of the Research Committee.
13. Are there any other types of fastness tests which you believe should be added to those already proposed by the Research Committee.
14. Suggest any special sub-committees which you believe could be advantageously appointed to accomplish any specific result.
15. Membership Research Fund: Our Five Dollar Membership dues are small in comparison with those of similar organizations, and do not provide sufficient income to properly carry on the regular activities of the Association, particularly the work of the Research Committee. Rather than increase the dues, a Membership Research Fund was started two years ago, and this, in connection with the returns from Corporate Memberships, have provided for such work as has so far been undertaken by the Research Committee. It is hoped that members will renew their subscriptions to this fund, and, if possible, make additional ones. It has been suggested that in the 1927 Year Book some mark of designation be placed before the names of those who have contributed during the year to the Research Fund.

   Will you contribute towards this Research Fund during the year 1927? If so, how much will you contribute?

   When payable?

   Will you endeavor to secure at least one Corporate Membership during the year?

   Who would you suggest as prospective Corporate members?
16. During the year 1927, four prizes of $100.00, $75.00, $50.00 and $25.00 have been offered for the best papers or communications published in the Proceedings of the Association. It is hoped that this series of prizes will promote a keener interest and desire to present papers before Local Sections, at the Annual Meeting, and also to forward communications to the Society for publication in the Proceedings.

ASSOCIATION BADGES

The lapel button badge illustrated herewith is worn by members of the American Association of Textile Chemists and Colorists.

The three "rings" are enameled in red, yellow and blue, respectively, and the initials and border are brought out in gold. The general effect is exceedingly attractive.

Badges may be secured at $1.50 each by addressing the Secretary.

WALTER E. HADLEY,
5 Mountain Avenue,
Maplewood, N. J.

TESTS FOR DETERIORATION OF STORED TABLE LINEN

Several years ago the Emergency Fleet Corporation had a large amount of linen material which developed weak places. On account of other causes it was impossible to determine at that time just how much deterioration was due to storage, although it was evident that this was a fairly large factor. Arrangements were made with the bureau to test the number of samples of completely bleached linen and a sample of unbleached linen to determine if possible what the effect would be when these materials were subjected to ordinary storage conditions. Tests were made at intervals of three months. It was noted very early in this series of tests that a marked variation in the results was being obtained. At the end of one year it was found that some of the samples had gained while other samples had lost some of the original strength. The remainder of the material was then laid out to provide a large number of representative samples in order to determine the variation of the material due to constructional features. The results showed a maximum variation in some cases of 15 per cent. The collection of the data resulted in the conclusion that no marked deterioration resulted from storing any of the linen samples for a period of one year.—Bureau of Standards Technical News Bulletin.

DISCLOSING COLORS

Tests Revealing Either Mineral Salts or Sulphur

When considering the class or group of colors which has been used in dyeing or padding a yarn or fabric, first a portion of the sample is burnt in a porcelain basin or capsule, being heated to a red heat. If a residue is left, it is analyzed carefully in the laboratory for iron, chrome, aluminum, or copper. Should any of these be found they indicate the presence of a mordant color, a pigment color, or a color that has been aftertreated with copper sulphate, copper sulphate and bichromate of potash, or bichromate of potash.

When no mineral salts of the above nature have been found in the ash another portion of the sample is boiled in a little freshly prepared stannous chloride solution containing concentrated hydrochloric acid. The mouth of the test tube in which this takes place is covered with a piece of filter paper that has been dipped in an acetate of lead solution. A black spot proves that sulphur colors are present.

Before, however, assuming the same as certain, another portion of the sample is boiled in a 10 per cent caustic soda bath for two minutes, and then in a solution prepared by dissolving 100 grams of pure stannous chloride in 100 c.c. of pure hydrochloric acid to which 500 c.c. of distilled water have been added, by covering as before the mouth of the test tube with a piece of filter paper dipped in a lead acetate solution. The repetition of the black stain would then indicate definitely the presence of sulphur colors.

If sulphur colors are not disclosed, another portion of the sample is boiled with a little sodium hydrosulphite. Should the color be discharged but return when boiled in a weak bichromate of potash or hydrogen peroxide solution, this indicates vat colors. When the yarn or fabric is dyed or padded with bright colors, a small cutting of the same is boiled in a weak caustic soda solution, and this latter extracted with a little ether; a colored ether layer then indicates the presence of basic colors.—The Textile Review.

TANNING WITH QUEBRACHO

In connection with the preparation of standard leather samples for use in researches on acid in leather, interesting observations have been made regarding the nature of a straight quebracho tannage. Seven 50 to 55 pound steer hides were used which were delimed with a commercial enzyme bate until neutral to phenolphthalein. The hides were then introduced into liquors made from ordinary solid quebracho of extract of 0.6 per cent tannin content. The concentration of the liquors was gradually increased until, after 25 days, it reached 4 per cent, between which value and 5 per cent it was maintained for 25 more days. The tannage throughout was allowed to proceed in a natural manner without the addition of any acids or acid-forming materials. At the conclusion of the tannage (50 days) the leather was washed, oiled, dried, sammied, rolled, and dried again. The physical appearance of the leather seemed satisfactory with respect to thickness, firmness, and color. The average yield was 60 per cent.

Observations of the hydrogen ion concentration of the liquors showed that the original solution of analytical strength had a pH value of 4.7. Three days after the hides were introduced the pH value had increased to 5.8, at which figure it remained throughout the 50-day period. As was to be expected, the finished leather gave a decided alkaline reaction, by the Proctor and Searle method.

A sample of the leather was removed from the liquors after 30 days, washed, oiled, and dried. The analysis of this sample gave the following results:

	Per Cent
Water-soluble material	18.13
Hide substance	46.10
Grease (petroleum-ether extract)	3.55
Moisture	8.75
Insoluble ash	.19
Combined tannin (by difference)	23.28
Degree of tannage	50.50
Total ash	.27

As reflected by the above analysis and the physical appearance of the leather as regards plumpness and fiber structure the removal of the leather at this point and the finishing of it into sole leather by extracting would seem to be a likely possibility.—Technical News Bulletin of Bureau of Standards.

NEW SUMMER AND FALL COLORS ON MILLINERY, WOOLEN AND KNIT GOODS CARDS

Eighteen millinery colors to be featured during the summer season have recently been selected by the Color Conference Committee of the Eastern Millinery Association and the Retail Millinery Association in co-operation with the Textile Color Card Association. All the eighteen shades are issued by the Textile Color Card Association on seasonal color cards. Hat colors that match and harmonize with garments and coats are made possible by this color co-operation.

Napoleon Blue, a bright blue with violet undertones, and Almond Green, a soft silvery green, are two of the fashionable shades selected from the fall 1927 color card of the association. Other delicate pastel tones chosen from this card are evening shades which belong to the series called Opera Tints. Chief among these is Ibis Pink; Liqueur Green, a very pale yellow green; Opera Mauve, a rosy orchid; Mellowglow, a light amber yellow; Bridal Rose, a pale raspberry; Debutante Pink, a faint rose petal shade; Aquagreen, a light bluish water green.

Fall 1927 Woolen Colors

The 1927 fall woolen color card is now ready for general distribution. "Rosy browns, such as Spanish Cedar, and new rust shades, such as Gingerspice, occupy an important place on the woolen card," said Margaret Hayden Rorke, commenting on the forty-eight woolen colors. "Ranges of mahogany browns include light, middle and dark values. Two ranges of greens are bluish greens and dark bottle greens. Vagabond and Canton Jade belong to the former group and Mountain and Forest Green to the latter. New blues are Roma Blue and Neapolitan Blue, bright but soft shades with violet undertones. Twelve gay colors, suitable for sport wear include Flash, a medium orange red; Muskmelon, a pale yellow orange; Araby, a light terra cotta, and Blue Aster, a cobalt blue.

Great care has been given to the harmonizing of silk and woolen colors. The fall silk colors, which are indorsed by the American Association of Woolen and Worsted Manufacturers, blend with the fall silk colors, also issued by the Textile Color Card Association.

Knitted Outerwear Colors

The Color Committee of the National Knitted Outerwear Association in co-operation with the Textile Color Card Association, has recently selected sixteen colors to be featured during the fall and winter months. The colors have been chosen from the floss edition of the 1927 Fall Season Card, issued by the Textile Color Card Association and the Fall 1927 Woolen Card.

INTERMEDIATE PRODUCTION FOR 1926

A review of the American dyestuff industry, its production, trade and progress during 1926 appeared in the April 18 issue of the Reporter as a preliminary report from the Tariff Commission, which is compiling the annual Census of Dyes.

The following supplementary statement and table show the production and sales of the principal coal-tar intermediates for 1926.

The total output of intermediates in 1926 was 229,549,000 pounds, as compared with 210,699,779 pounds in 1925. The sales in 1926 totaled 86,895,000 pounds valued at $18,976,000, or a unit value of 21.8 cents. This is a slight increase by quantity and 4 per cent decline in value from the previous year, when they amounted to 86,066,651 pounds, valued at $19,756,200, or 23 cents per pound.

NEW FOOD DYE APPROVED

A new green food dye, Fast Green FCF, has been added to the list of coal-tar colors that will be certified by the United States Department of Agriculture under existing certification regulations. The Acting Secretary of Agriculture has just signed Food Inspection Decision 209, which officially adds this new dye to the list of eleven other food colors previously permitted certification.

Before recommending its admission to the list of permitted coal-tar food dyes, the Bureau of Chemistry, which is charged with the enforcement of the Federal Food and Drugs Act, subjected the new green color to rigid chemical and physiological tests to prove its purity and harmlessness to health. Only dyes which are thus shown to be absolutely safe are placed on the list of colors accepted by the Government for certification and use, under the restrictions imposed by the Food and Drugs Act, in confectionery, bakery products, beverages, and other products to be eaten by the American people. Food manufacturers of this country who wish to employ a green color may now use, with no fear of harmful consequences, any one of three dyes: Guinea Green B, Light Green SF Yellowish and Fast Green FCF.

A copy of the description, specifications, and special analytical methods for Fast Green FCF (p-hydroxy derivative of the sodium salt by Alphazurine FG, Colour Index 671) may be had on request of the Bureau of Chemistry, United States Department of Agriculture, Washington, D. C.

Walter C. Taylor, class of 1913 in textile manufacturing of the Textile School of North Carolina, has become sales agent for G. Robinson and A. J. Pfeiffer, with headquarters at Charlotte, N. C. The former concern imports French viscose yarns, and A. J. Pfeiffer handles thrown silk and combination yarns.

AMERICAN
DYESTUFF REPORTER

Devoted to the use and application of dyestuffs and the mechanical equipment incidental thereto.

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OUR MOVE NEXT

THE news that an alliance of the British and German chemical industries has finally been arranged should cause little surprise here. Every move made by the dyestuff interests of the two countries during the past three years has served to bring them gradually together. So strong has each become that the mutual advantage of combining forces rather than openly fighting for world markets has long been obvious to both.

Three years ago, as our readers will recall, the British Dyestuffs Corporation seriously entertained German offers of a trade and manufacturing agreement. A satisfactory deal could not be completed at that time because the British Government, which then practically controlled the B. D. C., warily refused its sanction. The corporation severed its connection with the Government in 1925 and was reorganized as a well-financed, independent company. Rumor persisted that an agreement with the German dye trust would be the next logical step, since the company was free to make its own decisions.

But the directors of the B. D. C. conceived a wiser scheme—one that bespoke for them a world of business acumen. When the three largest British chemical manufacturers—Brunner, Mond & Co., Nobel Industries, Ltd., and the United Alkali Company—merged last October, the British Dyestuffs Corporation joined them to become part of the Imperial Chemical Industries, Ltd., Great Britain's most powerful trust. It is this combination, according to reports from Berlin and London, that has now consummated a pact with the German cartel.

Such a fusion of German and British chemical interests represents a far more formidable line-up of industrial powers than appears on its face. Most likely the compact will involve at least a reciprocal limitation of production and a division of markets. A friendly exchange of patents and processes will doubtless also be provided for. Combined, the I. G. and the Imperial Chemical Industries, Ltd., will control 37 per cent of the world's production and exports of chemicals and dyes and two-thirds of the entire dyestuff output.

The I. G. itself has been expanded to gigantic proportions during the past four years, with a bewildering web of activities stretching over a score of related chemical enterprises. While it has lately concentrated upon synthetic fertilizers and petroleum fuels, its operations in the explosives, lacquer, rayon and dyestuff fields has created one of the most powerful group of industries in Europe. It has absorbed and amalgamated many local plants, has obtained control of foreign companies and has merged its dyestuff sales agencies in the United States, Canada, England and the Far East.

But with all these ramified interests to divert its attention, it has wisely kept an active eye on the development of its dyestuff division. It has striven to regain its pre-war markets by underselling competitors, and to break through tariff walls and embargoes by strategem and commercial treaty. Now, with the British agreement settled, it will be well prepared to wage a commercial war against the United States over what remains of the world's dye markets.

Under the terms of their pact the British and the Germans will be able to expand technical research, slash prices and dominate the chemical markets of the world. In time we may even see our dyestuff imports increase as the more expensive foreign products drop in price and break through our tariff. Not only our dye manufacturers but the entire American chemical industry will feel the effects of the Anglo-German merger.

Meanwhile, other European dye trusts either have been formed or are being planned. In Italy the Fabriche Italiane Materia Coloranti Bonelli has recently joined a group of four other large dyestuff concerns. The French have just organized a "Union Chemique," or union of the chemical trades, which is regarded by authorities as leading toward a huge international cartel that will include the German, British, French and Italian industries. Some reports even assert that the Swiss producers will also be linked with this powerful combine, but this may be questioned. Switzerland is justly proud of her well-organized dye industry and cannot easily be tempted to hazard its independence by entering into relations with so formidable a rival as the I. G.

How much longer does the American dye industry intend to remain a mere spectator in this interesting game of international card-stacking? Does our industry clearly understand the magnitude of the issue that it must now face? There is not space nor is there need to repeat here what has been so often stressed in these columns in urging some definite action on that issue. American dyestuff

manufacturers have not remained indifferent to the pleas for a more co-operative industry. They have discussed the problem from every angle, and no one knows the solution better than they. Obeying an economic law, that solution is slowly working itself out. Smaller firms are being absorbed by the larger producers; there is an increasing tendency to concentrate production of certain types of colors within a group of large manufacturers.

This process, however, is much too slow and the European scene is changing too rapidly not to constitute a real menace. The issue in this country must be forced before long if our industry hopes to hold its present eminent place in the world's dye trade. A workable plan must very soon be evolved to control dye manufacture, eliminate all dangerous competition and assure American manufacturers a more profitable business. The anti-trust laws, which have apparently not hindered other industries from forming trusts, should certainly not be allowed to stand in the way when the safety of our key industry is threatened; proper Federal checks can be devised to protect consumers. But delay and indecision at this crucial time may prove disastrous later, when the new phalanx in Europe looses its full force against us.

A BUSINESS MAN TALKS ABOUT RESEARCH

SCIENTISTS and other technical men who are advocating industrial research, knowing what it has done for industry, may wonder why large sections of business remain coldly indifferent to their ideas. Perhaps they, themselves, can be blamed for this indifference. They may be theorizing too much.

The conservative type of business man shies at theories; he likes facts. Technical research must be presented graphically if we would convince business men that it is more than a fad. The facts and figures that tell why it is a profitable investment for industry must not be obscured by mouthy scientific phrases. Research should not be made too imposing; we should avoid conveying the impression that it is a kind of industrial genii whose every wave of wand creates miracles.

Among technical men research may safely be treated theoretically, but to industry it should be treated as a cold business proposition. It waves no wands nor chants no secret sesames. It works with tangible, common things, with measurements, calculations and tests, with chemicals and bits of wood and cotton. When more business men understand this they will understand how such work can make money for them.

It takes a business man like A. Lincoln Filene, of Boston, to present research in this light. Mr. Filene is chairman of the Research Committee of the New England Council. Recently he addressed the council in these words:

"We know of some New England manufacturers who are wasting thousands of dollars each year by dumping by-products. We also know of the Brown Company, of Berlin, N. H., who did this:

"They needed chlorine for bleaching, and twenty years ago bought it in England. The product they bought there was not only a serious fire risk in shipping, but contained only one-third of useful chlorine. They established a research department which tackled the problem. Through the use of cheap water power at their command they developed a new way to convert common salt into chlorine. This process produced caustic soda and hydrogen gas as by-products.

"So they built up a market for caustic in New England, which in a few years became so profitable that they had to increase their plant capacity to meet the demand.

"In the meantime, they continued making paper, of course.

"The enlarged chlorine plant gave them more chlorine than they needed for bleaching. So they manufactured chloroform and sold it for anaesthetics and carbon tetrachloride which they sold as solvent and for use in fire extinguishers.

"In the meantime, the hydrogen had been going to waste, so the research department experimented with a vegetable lard, which is hydrogenated oil. This has become so successful that they are to-day developing 10,000 acres of recovered Everglades in Florida on which to grow peanuts to produce oil. The oil is shipped to New Hampshire, hydrogenated with their erstwhile waste product and sold profitably as a vegetable lard.

"Through properly directed research the Brown Company have turned their paper mill into a diversified industry. *Some* branch of their business is bound to be profitable, even though another might be suffering from a temporary depression. And imagine the profits when all branches are going well."

USE OF LIQUID CHLORINE IN AMERICA

The first commercial American liquid chlorine was manufactured in 1909 and was shipped in steel cylinders of German manufacture, containing 100 pounds each. The business grew slowly but surely, largely through the pioneer efforts of E. D. Kingsley, who spared no effort to interest, first, the bleachers of cotton textiles and, a little later, municipal waterworks which had already, in a few cases, begun to treat potable water supplies with bleaching powder.

In 1909 the first American 15-ton tank car for railroad transportation of liquid chlorine was put into service, the chlorine being used in the detinning of scrap tin. Cylinders containing 150 pounds came into use and, in 1917, the U. S. Army Chemical Warfare Service used a 1-ton container. Still later, a car holding fifteen of the 1-ton tanks was put into service. In the American industry at this time over 300 tank cars of both types and 80,000 cylinders are in use. The transportation of liquid chlorine is regulated by law in the United States. The regulations are elaborate and are rigorously enforced and great quantities

of liquid chlorine are transported and handled yearly with absence of accident.

A technic in the application of chlorine, on release from the containers, has been built up. This shift from bleaching powder to chlorine illustrates well the modern tendency in chemical industries to use elemental or simple substances in concentrated form.—Journal of Chemical Education.

RECENT LITERATURE

Dry Cleaning Practice

Some Standard Practices for Cleansing. National Association of Dyers and Cleaners, Washington, D. C. 38 pages.

This standard of practice booklet is published for the purpose of making known some of the methods used in the dry cleaning industry. And to offer a specification test by which fabric may be rated for maintenance by the commercial dry cleaning while in service to the consumer as garments.

Dry cleaning is a discovery for removing soil from fabric by cleansing in a petroleum distillate known to the industry under a trade name of Stoddard Solvent. It is unlike gasoline in one point of having a high flash rated at 100 deg. Fahr.

Not all soil and stain incident to ordinary wear of outer apparel can be removed in dry cleaning. Therefore, a wet process of cleansing in water is sometimes necessary in addition to dry cleaning, requiring fabric to withstand both processes safely during refreshment.

Color Glasses Studied

The Lovibond Color System: 1. A Spectrophotometric Analysis of the Lovibond Glasses. By K. S. Gibson and F. K. Harris. Scientific Papers of the Bureau of Standards No. 547. 46 pages. Charts and graphs. 15 cents.

"To specify in fundamental absolute terms the essential properties of the Lovibond glasses as they now exist" is stated as the object of this paper. Whatever special or short-cut methods of calibration may be developed in the future it is certain, say the authors, that the data in this paper will remain the fundamental specification of the glasses in question. As such they are of the utmost permanent value.

A spectrophotometric analysis of the Lovibond glasses was made as the first step in the development of methods of grading these glasses. The spectral transmissions from 380 to 750 *mu* and the integral transmissions for sunlight are presented in the paper in the form of tables and curves.

The discussion touches briefly on certain troubles found by users of the Lovibond system of color grading, illustrating specifically the need for and the difficulties involved in the regrading of the glasses themselves. Methods of grading will be developed in later papers.

A Colorimeter Described

The Guild Trichromatic Colorimeter. Adam Hilger, Ltd., London, Eng. Illustrated.

The Trichromatic Colorimeter is an instrument for the analysis, measurement and specification of color, designed by J. Guild of the National Physical Laboratory. It measures and specifies color numerically, and, according to the description in this brochure, can produce any color at any time from the numerical specification.

In this illustrated booklet the operation and construction of the instrument is described fully, as well as its application in various industries.

AID TO THE CORRECT DETERMINATION OF COLOR PERFECTED BY BUREAU OF STANDARDS

Color plays an important part in many industries, the color of a product often governing its acceptability and price. The determination of color is therefore a matter of great importance, and has received special attention at the Bureau of Standards.

The quantitative estimation of color differences and of concentration of coloring matter varies with the efficiency of the chemical processes used in preparing the necessary solutions. For instance, in determining the color of sugar, a most important matter, the color is calculated from observed light intensities which are found by passing monochromatic light (light of one color) through a solution of sugar and analyzing the resulting spectrum. In preparing these solutions it is essential that nothing be introduced which will change the color characteristics of the sugar.

The bureau has just issued a technologic paper which describes an adequate chemical analytical method of preparing concentrated solutions of technical sugar products. In this method an improved process of colorimetric clarification is employed. Specially prepared asbestos is used as a filter medium.

The antiquated process of preparing dilute solutions by means of filter paper and filtering aids which were formerly thought to be neutral towards color, is discarded for the reason that by this method erroneous estimates are obtained. The efficiency of this old method has never been at any time subjected to vigorous systematic tests by precision instruments. Therefore, the changes in color

quality were either not recognized or not considered with sufficient concern. The present paper is a forerunner of several other publications concerned with the analytical results of this investigation.

Copies of this paper (Technologic Paper No. 338) may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., at 20 cents each.

THE PURPOSE AND PRACTICE OF SOURING

(*Continued from page* 308)

In practice, however, it is preferable to use a smaller amount of sour at a higher temperature to accomplish certain results than it is to use more sour at a lower temperature. This is not merely a matter of economy, but a matter of safety as the problem of rinsing out the sour is less troublesome when there is only a small amount to be removed. The smaller amount of sour requires the boosting action of heat to force it into chemical reaction with other materials.

As in the case of other supplies used in washing, concentration or strength of the solution is important from the standpoint of economy. A certain percentage or strength must be built up before the sour will take hold. In practice, the water volume is kept down to minimum practical limits to aid in reaching the desired concentration with a minimum amount of sour.

When bluing is to be conducted in the sour bath, the latter, after running a few minutes, is diluted with cold water to a higher level and the blue solution added.

Wherever possible, it is preferable in a formula to distribute the blue in the goods before adding the sour. The reason for this is that otherwise the sour acting as a mordant will seize the first blue which strikes the goods and set it in a stronger concentration, the result of which will be a patchy or uneven bluing.

This method is not wholly practical unless one should neutralize, rinse, blue and then sour on top of this delayed blue bath, but the point is merely one which if applied will help to obtain the best in bluing results.

Operations After Sour

The operations which follow the sour are largely dependent upon the kind of sour used. In the event any destructive sour is used two or three hot rinses at least should follow the sour bath.

Oxalic acid should always be dissolved before placing in the wheel, and always completely rinsed out.

The sulphuric acid sours are not recommended under any conditions. While it is true that with great care the process may be controlled so that the chances for damage might be limited, the destructive capacity of this sour is so great and quick that we do not feel it should be used in any washroom.

Acetic acid and oxalic acid are frequently mixed on the basis of 1 gallon 56 per cent acetic acid, 1 pound oxalic and two gallons of water. This mixed sour is effective for all round souring purposes, but the damaging factor of oxalic is always present.

How Much Sour

The amount of sour to use varies with different conditions of water, builder hangover, etc. By indicator tests the proper amount to just bring the goods nicely on the acid side may be determined.

The average consumption of sour per 100 pounds of goods is about 1 quart of the acetic-oxalic mixture, or 4 ounces of oxalic acid.

Neutralizing Scale

The relative neutralizing values of some of the sours is given below:

1 oz. 56 per cent Acetic Acid equals about:
- .6 oz. Oxalic Acid
- .5 oz. Sulphuric Acid Concentrated
- 1.4 oz. Nitre Cake (33 per cent)
- .5 oz. Sodium Silico Fluoride
- .6 oz. Sodium Acid Fluoride
- 1.0 oz. 35 per cent Muriatic Acid
- 1.0 oz. Sodium Bisulphite
- 2.0 oz. Lactic Acid (44 per cent)

(*Part II will appear in an early issue.*)

CAMPBELL ANNOUNCES COLORS FOR CELANESE

A new series of Camel dyes known as the Celanols for dyeing Celanese yarns and fabrics has been added to the range of colors manufactured by John Campbell & Co. They are in powder form and, according to the announcement, one important advantage is that there is no precipitation or evaporation. In use, the dye is dissolved in lukewarm water and applied to the material without assistants. They are described further as being of exceptional brilliance and fastness to light and washing. They leave cotton, wool, silk and rayon white. The range includes fourteen shades.

Secretary Mellon has appointed Ernest W. Camp, formerly director of the Division of Customs, to be Acting Commissioner of Customs. This office is the highest one provided for in the bill, which passed Congress just before adjournment, creating a Bureau of Prohibition and a Bureau of Customs in the Treasury Department. Under this act the Commissioner of Customs is directly responsible to the Secretary of the Treasury

Dyes Imported Through New York and Other Ports During April

Compiled by the Chemical Division of the Bureau of Foreign and Domestic Commerce in Collaboration with the Chemical Division of the United States Tariff Commission

KEY TO ABBREVIATIONS OF MANUFACTURERS' NAMES

1—THE SIX LEADING GERMAN COMPANIES

IG—Interessen-Gemeinschaft der Farbenindustrie.
A—Actien-Gesellschaft fur Anilin-Fabrikation, Berlin. Founded 1873.
B—Badische Anilin-und-Soda-Fabrik, Ludwigshafen-on-the-Rhine. Founded 1865.
By—Farbenfabriken, vormals Friedr. Bayer & Co., Leverkusen-on-the-Rhine. Founded 1862.
C—Leopold Cassella & Co., Frankfort-on-the-Main. Founded 1870.
K—Kalle & Co., A. G., Biebrich-on-the-Rhine. Founded 1870.
M—Farbwerke, vormals Meister Lucius & Bruning, Hochst-on-the Main. Founded 1862.

2—THE SMALLER GERMAN COMPANIES

BK—Leipziger Anilinfabrik Boyer & Kegel, Furstenberg, near Leipzig. Founded 1882.
CG—Chemikaliewerk Griesheim G. m. b. H., Griesheim-on-the-Main. Founded 1882.
CJ—Carl Jager G. m. b. H., Anilinfarbenfabrik, Dusseldorf. Founded 1823
GrE—Chemische Fabrik Griesheim-Electron, Offenbach-on-the-Main. Founded 1842.
L—Farbwerk Mulheim, vormals A. Leonhardt & Co., Mulheim-on-the-Main. Founded 1879
Seig.—G. Seigle Corporation, Stuttgart.
tM—Chemische Fabriken, vormals Weiler ter Meer, Uerdingen-on-the-Rhine. Founded 1877.
WD—Wulfing, Dahl & Co., A. G. Barmen. Founded 1842.

3—SWISS COMPANIES (ALL AT BASEL)

DH—Farbwerke vormals L. Durand, Huguenin & Co. Founded 1871.
G—Anilinfarben-und Extract-Fabriken, vormals Joh. Rud. Geigy. Founded 1764.
I—Gesellschaft fur chemische Industrie. Founded 1885.
S—Chemische Fabrik, vormals Sandoz & Co. Founded 1887

4—DUTCH AND FRENCH COMPANIES

FA—Farbwerk Ammersfoort, Ammersfoort, Netherlands. Founded 1888
NF—Niederlandische Farben-und-Chemikalienfabrik Delft, Delft, Netherlands. Founded 1897.
CN—Compagnie Nationale de Matieres Colorantes et Produits Chimiques. Founded 1917. (Etablissements Kuhlmann merged with this company in 1923.)
P—Societe Anonyme des Matieres Colorantes et Produits Chimiques St. Denis (formerly A. Poirrier). Founded 1830.

5—ENGLISH COMPANIES

Bro—Brotherton & Co., Ltd., City Chambers, Leeds.
BAC—British Alizarine Co., Ltd., Manchester
BD—British Dyestuffs Corporation, Ltd., London.
Cl Co.—The Clayton Aniline Co., Ltd., Clayton, Manchester.
CV—The Colne Vale Dye & Chemical Co., Ltd., Milnsbridge, Huddersfield.
Hol—L. B. Holliday & Co., Ltd., Huddersfield.
Scot—Scottish Dyes, Ltd., Grangemouth.

IMPORTS of coal-tar dyes through New York and other ports during the month of April were slightly under those for March. The total was 402,783 pounds, valued at $323,732. Imports by ports were as follows: New York, 390,302 pounds, with an invoice value of $310,818; Boston, 11,253 pounds, with an invoice value of $11,356; Philadelphia, 965 pounds, with an invoice value of $849; Rochester, 180 pounds, with an invoice value of $350; Chicago, 56 pounds, with an invoice value of $196; San Francisco, 27 pounds, valued at $163.

Imports of Synthetic Dyes

	Pounds	Invoice Value
1927—		
January	196,620	$186,387
February	312,277	262,364
March	404,714	352,414
April	402,783	323,732
Total	1,316,394	$1,124,897
1926—		
January	300,441	$283,635
February	369,045	377,638
March	487,804	435,891
April	437,526	401,606
Total	1,594,816	$1,498,770

Five Leading Dyes, by Quantity, Imported During April

	Pounds
Rhodamine B (single strength)	22,050
Brilliant Indigo 4B (single strength)	13,826
Alizarine Red VI Extra Pure	11,025
Ciba Red 3B (single strength)	8,261
Vat Brown R (single strength)	8,188

Dyes and Intermediates Remaining in Bonded Customs Warehouse

	Dyes and Colors (pounds)	Intermediates (pounds)
July 31, 1926	512,186	?81,?96
August 31, 1926	55?,852	690,031
September 30, 1926	395,535	590,520
October 31, 1926	281,320	55?,25?
November 30, 1926	303,321	539,561
December 31, 1926	360,488	562,536
January 31, 192?	615,542	64?,692
February 28, 192?	896,059	?19,055

Per Cent of Dyes by Country of Shipment

	192?			
	Apr.	Mar.	Feb.	Jan.
Germany	64.0	40.0	49.5	3?.0
Switzerland	18.0	42.0	33.9	34.0
Belgium	?.0	4.0	4.9	11.0
England	4.0	?.0	4.6	?.0
France	3.0	3.0	1.3	?.0
Italy	1.0	2.0	0.3	3.0
Canada	3.0	2.0	5.3	1.0
Holland	..	..	0.2	..

The dyes in this report are grouped by both Colour Index and Schultz numbers, and in the case of those which could not be identified by either number the classification according to the ordinary method of application was adopted. As the pastes and powders of the vat dyes vary widely in strength and quantity, each vat dye has been reduced—in nearly every case—to a single-strength basis.

DYES OF COAL-TAR ORIGIN

Col. Index No.	Schultz No.	Name of Dye and Mfr.	Quantity (pounds)
11	—	Amido Yellow E—(IG)	100
32	182	Brilliant Sulphon Red B—(S)	2,000
70	—	Rapid Fast Red GL Paste—(IG)	7,000
104	—	Metachrome Olive Brown G Pdr.—(Bro.)	500
105	88	Acid Anthracene Brown R—(IG)	300
172	159	Acid Alizarine Black R—(IG)	500
225	194	Thiazine Red RXX—(IG)	250
236	222	Yellow JG—(IG)	200
252	227	Cotton Scarlet Extra—(IG)	150
267	241	Neutral Gray G—IG)	50
278	—	Chlorazol Fast Red KX—(BDC)	200
288	256	Sulphoncyanine G—(IG)	500
316	273	Blue NA—(IG) Diaminogen NA—(C)	908
324	—	Diazo Brilliant Orange GR Extra—(By)	1,213
325	—	Benzo Brilliant Violet B—(By)	226
326	279	Benzo Fast Orange WS—(IG)	100
382	319	Diamine Scarlet 3B—(IG)	500
430	—	Polar Red RS Conc.—(G)	551
436	358	Chloramine Brilliant Red 8B Conc.—(S) Chloramine Red 8BS Powder—(By) Toluylene Red Powder—(AG)	1,554
440	360	Ignamine Orange R—(IG)	200
441	—	Chromocitronine R—(DH)	441
459	373	Congo Orange R—(IG) Diamine Orange F—(IG) Diamine Orange F—(C)	660
487	400	Acid Anthracene Red 3B—(IG) Acid Milling Red R—(G)	1,202
518	424	Diamine Sky Blue FF—(IG)	100
561	449	Trisulphon Brown B Conc.—(S)	3,022
578	459	Universal Dark Blue C—(IG)	100
636	19	Fast Light Yellow 3G—(IG)	500
639	22	Xylene Light Yellow 2G—(S)	1,000
645	—	Kiton Fast Yellow 3G—(I)	1,433
649	26	Triazogene Orange R Powder—(IG)	200
658	496	Rhoduline Blue 6G—(IG)	550
663	500	Setocyanine—(G)	220
667	503	Benzyl Green B—(I) Erioviridine B Supra—(G) Poseidon Green SGX—(IG)	2,463
670	505	Acid Green Conc. Powder—(M) Light Green SF Yellowish XX—(IG) Light Green SF Yellowish X—(B)	725
673	508	Xylene Blue AS Conc.—(S)	1,000
677	512	Diamond Magenta I—(IG)	50
681	516	Crystal Violet Extra Powder—(IG)	500
690	522	Victoria Blue 4R High Conc.—(IG)	100
691	523	Fast Green Extra Blue Shade—(IG) Fast Green Extra Bluish—(By)	4,118
704	536	Alkali Blue 3R Conc.—(IG)	1,000
707	539	Soluble Ble 5R Conc.—(IG) Soluble Blue T—(IG) Water Blue Powder—(IG)	350
712	543	Patent Blue V—(IG) Patent Blue V Extra—(IG)	1,500
714	545	Brilliant Acid Blue A—(IG) Kiton Blue A—(I) Patent Blue A—(Q) Poseidon Blue BXX—(IG) Poseidon Blue BR Conc.—(IG) Poseidon Blue BR Extra—(IG)	4,071
715	546	Blue Extra—(IG) Blue FF Powder—(C) Cyanol Extra—(C)	782
718	549	Brilliant Chrome Violet 4B—(DH)	110
721	552	Chromal Blue GC—(G)	331
723	554	Chrome Azurol S Conc.—(G)	1,653
727	557	Chrome Violet—(G)	110
733	562	Intensive Blue B—(IG) Intensive Blue B—(By)	431
735	564	Naphthalene Green V Powder—(M) Poseidon Green VGGX—(IG)	842
737	566	Wool Green S—(I) Wool Green S Conc.—(I)	771
748	579	Sulphorhodamine B Extra—(IG)	300
749	573	Rhodamine B Conc.—(G) Rhodamine B Extra—(I) Rhodamine B Extra—(IG) Rhodamine B Extra—(Q)	22,050
752	571	Rhodamine 6G Conc. (s. s.)—(G)	105
762	—	Chromorhodine BR—(DH)	441
786	—	Auracine G—(G)	110
787	—	Coriphosphine OX Extra—(By)	200
789	—	Brilliant Phosphine 5G—(I)	551
793	606	Phosphine O—(IG)	200
797	608	Patent Phosphine GRNTN—(IG)	2,000
801	613	Quinoline Yellow Extra—(IG)	200
815	618	Rhoduline Yellow 6G—(IG) Basic Yellow T—(IG)	300
828	672	Azo Carmine GX—(IG)	25
833	—	Wool Fast Blue BL—(IG) Wool Fast Blue GL—(IG) Benzyl Fast Blue GL—(I) Xylene Milling Blue AE Conc.—(S)	2,837

Col. Index No.	Schultz No.	Name of Dye and Mfr.	Quantity (pounds)
842	680	Methylene Violet 3RA Extra—(IG)	250
851	690	Diphene Blue R—(IG)	3,100
865	700	Nigrosine T—(IG)	400
873	681	Direct Gray R Paste—(G)	441
873	681	Malta Gray J—(CN)	661
873	681	Methylene Gray B New—(IG)	100
875	923	Fur Olive 3G—(IG)	
		Furrol Gray G—(IG)	
		Fuscamine F—(IG)	
		Nako DMG, RHG—(IG)	340
884	627	Chromacetine Blue S Extra—(DH)	
		Modern Cyanine N—(DH)	904
892	635	Modern Violet—(DH)	441
894	637	Gallamine Blue Extra Paste—(G)	1,720
913	653	Danubia Blue BX—(IG)	250
924	660	Methylene Green G Extra Conc.—(S)	1,000
925	—	Toluidine Blue—(IG)	20
926	661	Basic Blue GO—(M)	
		Thionine Blue GO—(IG)	857
927	663	New Methylene Blue N—(IG)	700
1006	746	Pyrogene Green 3G—(I)	772
1027	778	Alizarine Red VI Extra Pure—(IG)	11,025
1032	797	Alizarine Claret Red R Paste—(IG)	500
1033	779	Alizarine Orange A Paste—(IG)	882
1034	780	Alizarine Carmine—(Q)	
		Alizarine Red IWS Powder—(M)	
		Alizarine Red S Powder—(IG)	
		Alizarine Red SW Powder—(I)	1,966
1035	782	Anthracene Brown R Powder—(IG)	600
1040	784	Alizarine Red SX Paste—(IG)	2,196
1060	801	Anthracene Blue SWG Powder—(IG)	1,000
1063	790	Anthracene Blue SWR Powder—(IG)	3,300
1064	—	Alizarine Cyclamine R Paste—(IG)	5,955
1067	804	Alizarine Blue S Powder—(IG)	662
1071	808	Alizarine Green S Paste—(BDC)	400
1073	852	Alizarine Irisol R Powder—(IG)	572
1075	856	Alizarine Blue AS Powder—(By)	550
1084	854	Alizarine Viridins FF Powder—(IG)	1,125
1085	862	Alizarine Blue Black B Powder—(IG)	
		Chrome Blue Black B Powder—(I)	731
1088	855	Alizarine Sky Blue B Powder—(By)	
		Alizarine Sky Blue B Powder—(IG)	1,047
1095	759	Anthra Yellow GC Paste—(IG)	
		Anthra Yellow GC Paste Fine—(IG)	
		Anthra Yellow GC Double Paste—(B)	
		Anthra Yellow GC Powder (s. s.)—(IG)	4,586
1096	760	Vat Golden Orange G Dbl. Pst. (s. s.)—(IG)	
		Vat Golden Orange G Pdr. (s. s.)—(IG)	1,370
1097	761	Vat Orange RRT Paste—(B)	
		Vat Orange RRT Paste Fine—(IG)	
		Vat Orange RRTS Powder (s. s.)—(IG)	3,235
1099	763	Vat Dark Blue BOA Paste—(B)	
		Vat Dark Blue BOA Paste Fine—(IG)	4,824
1102	765	Vat Black B Paste—(B)	
		Vat Black BB Double Paste—(IG)	
		Vat Black BB Double Paste Fine—(IG)	3,116
1104	767	Vat Brilliant Violet RR Paste Fine—(IG)	2,361
1106	838	Vat Blue RS Triple Powder (s. s.)—(IG)	900
1113	842	Vat Blue GCD Double Paste (s. s.)—(IG)	
		Vat Blue GCD Dbl. Pst. Fine (s. s.)—(IG)	
		Vat Blue GCDN Powder (s. s.)—(IG)	7,116
1114	—	Vat Blue BCS Powder (s. s.)—(IG)	2,480
1116	847	Vat Green BB Powder (s. s.)—(IG)	3,200
1118	849	Vat Yellow G Dbl. Pst. Fine (s. s.)—(IG)	
		Vat Yellow G Powder Fine (s. s.)—(IG)	6,126
1120	867	Anthra Brown B Paste—(IG)	428
1133	819	Algol Red R Extra Powder (s. s.)—(IG)	1,200
1134	821	Vat Violet 3B Powder (s.s.)—(GrE)	344
1135	820	Vat Brilliant Violet RK Powder (s. s.)—(IG)	400
1138	810	Helindone Yellow 3GN Pdr. (s. s.)—(IG)	250
1143	827	Anthra Bordeaux R Paste—(B)	
		Anthra Claret R Powder (s. s.)—(IG)	1,060
1150	833	Vat Olive R Paste—(IG)	
		Vat Olive R Powder (s. s.)—(IG)	6,059
1151	—	Grelanone Brown RR Paste—(GrE)	
		Vat Brown R Paste—(By)	
		Vat Brown R Paste—(IG)	
		Vat Brown R Powder (s. s.)—(IG)	8,188
1152	—	Vat Brown G Paste—(IG)	2,391
1162	831	Vat Red RK Paste Fine—(IG)	
		Vat Red RK Powder (s. s.)—(IG)	
		Vat Red RK Paste—(B)	4,094
1163	832	Vat Violet BN Paste—(IG)	
		Vat Violet BN Paste Fine—(B)	
		Vat Violet BN Powder (s. s.)—(IG)	1,660
1172	794	Cibanone Black 2B Fine—(I)	1,320
1178	876	Indigo White Paste—(B)	27
1184	881	Brilliant Indigo 4B Paste Fine—(IG)	
		Brilliant Indigo 4B Powder (s. s.)—(IG)	
		Brilliant Indigo 4B Powder (s. s.)—(B)	13,826
1186	883	Indigo MLB/6B Powder (s. s.)—(IG)	5,000
1188	884	Brilliant Indigo BB Paste—(IG)	507
1190	885	Brilliant Indigo BASF/B Paste—(IG)	2,518
1202	893	Alizarine Indigo G Paste—(By)	798
1207	912	Anthra Red B Paste Fine—(IG)	996
1211	910	Helindone Pink AN Paste—(IG)	
		Helindone Pink BN Paste—(IG)	3,500
1212	918	Ciba Red 3B Powder (s. s.)—(I)	
		Vat Red Violet RH Paste—(B)	
		Vat Red Violet RH Paste Fine—(IG)	8,261
1217	913	Helindone Orange R Paste—(IG)	
		Helindone Orange R Powder (s. s.)—(IG)	
		Hydron Orange RF Paste—(IG)	4,000
1218	915	Vat Scarlet R Paste—(IG)	200
1228	907	Anthra Scarlet 2G Paste—(B)	
		Thioindigo Scarlet 2G Paste—(IG)	4,580
1229	908	Ciba Red R Paste—(I)	6,172
1247	—	Indigo, Natural	2,308

UNIDENTIFIED DYES

Acid Dyes

Name of Dye and Manufacturer	Quantity (pounds)
Acid Pure Blue R Supra—(G)	2,204
Alizarine Brilliant Sky Blue R—(IG)	100
Alizarine Light Blue LR Conc.—(S)	500
Alkali Violet 10B—(By)	55
Amido Fast Red 2G—(IG)	100
Brilliant Acid Blue FF—(By)	220
Brilliant Milling Blue B Powder—(C)	
Brilliant Milling Blue B Powder—(IG)	5,173
Brilliant Violet SB—(Q)	110
Brilliant Wool Blue FFR—(IG)	2,325
Cloth Fast Red 3B—(I)	551
Cloth Fast Yellow G—(I)	551
Guinea Brown R—(IG)	25
Indocyanine B—(IG)	500
Indocyanine FF—(IG)	100
Kiton Fast Red 4BL—(I)	1,322
Milling Red NJ—(CN)	1,102
Naphthol Black BGN Conc.—(IG)	200
Neolan Verdon B—(I)	220
Novazol Blue B—(G)	1,653

Name of Dye and Manufacturer	Quantity (pounds)
Novazol Violet B—(G)	551
Onis 3B—(IG)	300
Pilatus Fast Blue BR—(IG)	200
Pilatus Fast Green BL Conc.—(IG)	100
Pilatus Fast Pink BG—(IG)	350
Pilatus Fast Red R--(IG)	50
Polar Orange R Conc.—(G)	2,205
Polar Red B Conc.—(G)	551
Polar Yellow 2G Conc.—(G)	1,102
Radio Navy Blue B—(IG)	100
Silk Yellow R—(IG)	300
Sulphon Orange G—(IG)	200
Sulphon Yellow 5G—(IG)	50
Supramine Blue R—(IG)	100
Supramine Red B—(IG)	400
Supramine Red 3B—(IG)	1,000
Supramine Violet B—(IG)	50
Supramine Yellow 3G—(IG)	100
Wool Black GRF—(IG)	3,000
Wool Black N—(IG)	50
Wool Blue R Extra—(IG)	100
Xylene Milling Red B Conc.—(S)	500

Vat Dyes

Anthra Orange RH Paste Fine—(IG)	1,500
Anthra Pink B Extra Paste—(IG)	4,000
Anthra Pink R Extra Paste Fine—(IG)	1,000
Anthra Scarlet B Paste—(IG)	500
Cibanone Red 4B Powder (s. s.)—(I)	1,650
Eridan Brilliant Scarlet B Paste—(IG)	550
Grelanone Red 2B Powder (s. s.)—(IG)	400
Helindone Printing Black RD Paste—(IG)	7,500
Hydron Brown G Paste—(IG)	1,191
Hydron Brown R Paste—(IG)	1,588
Hydron Navy Blue C Paste—(IG)	300
Hydron Olive GN Paste—(IG)	1,191
Hydron Pink FF Paste—(IG)	5,000
Hydron Scarlet 3B Paste—(C)	1,102
Hydron Violet R Powder (s. s.)—(IG)	250
Hydron Violet RF Paste Highly Conc.—(IG)	300
Hydron Yellow Brown G Paste—(IG)	500
Indigosol O4B—(IG)	
Indigosol O4B—(DH)	420
Indigosol Pink HR Extra—(DH)	110
Indigosol Red HR—(DH)	55
Indigosol Scarlet HB—(DH)	55
Indigosol Violet ALB—(DH)	110
Vat Black BGA Double Paste (s. s.)—(IG)	838
Vat Blue RSN Powder—(IG)	25
Vat Blue RL Double Paste (s. s.)—(IG)	2,000
Vat Blue Green B Double Paste Fine (s. s.)—(IG)	1,018
Vat Brilliant Blue R Paste—(B)	470
Vat Brown WM Powder—(IG)	100
Vat Colden Orange 3G Paste—(IG)	
Vat Golden Orange 3G Powder (s. s.)—(IG)	2,088
Vat Golden Yellow GK Double Paste Fine (s. s.)—(IG)	1,000
Vat Gray RRH Powder (s. s.)—(IG)	1,050
Vat Green G Powder (s. s.)—(IG)	400
Vat Green GG Double Paste (s. s.)—(IG)	
Vat Green GG Double Paste (s. s.)—(B)	3,174
Vat Green GG Powder—(IG)	
Vat Khaki GG Paste—(IG)	960
Vat Orange 3R Paste Fine—(IG)	496
Vat Pink B Powder (s. s.)—(IG)	1,000
Vat Printing Black BR Paste—(By)	882
Vat Printing Brown R Paste—(IG)	
Vat Printing Brown R Paste—(By)	3,034

Name of Dye and Manufacturer	Quantity (pounds)

Mordant and Chrome Dyes

Acid Alizarine Gray G Powder—(M)	632
Alizarine Fast Gray 2BL—(IG)	525
Alizarine Fast Violet R—(I)	110
Alizarine Light Gray BS Conc.—(S)	2,000
Acid Anthracene Brown PG—(By)	555
Anthracene Chromate Brown EB—(IG)	1,500
Azol Printing Red 2B Extra—(By)	100
Brilliant Chrome Blue 2B—(DH)	220
Brilliant Chrome Violet 3RN—(DH)	220
Chromanol Black RVI—(DH)	220
Chromazurine DN—(DH)	441
Chrome Fast Phosphine B—(DH)	110
Chrome Fast Phosphine 2RD—(DH)	110
Chrome Fast Xanthine 2R, RD—(DH)	440
Chrome Green GR—(DH)	55
Chrome Printing Red B—(DH)	441
Chrome Printing Red Y—(DH)	441
Chromochlorine G—(DH)	55
Chromocitronine V—(DH)	220
Chromoxane Pure Blue B—(IG)	300
Colonial Blue R—(DH)	220
Eriochrome Brilliant Violet B Supra—(G)	551
Eriochromal Brown AEB—(G)	55
Eriochrome Red G—(G)	1,102
Fast Chrome Green BN—(DH)	55
Gallo Navy Blue 2GD Powder—(IG)	10
Metachrome Blue Black AG—(AG)	500
Modern Blue CVI—(DH)	220
Modern Green N—(DH)	220
Omega Chrome Brown EB—(S)	1,000

Direct Dyes

Benzo Bordeaux 6B—(IG)	220
Benzo Bronze E—(By)	110
Benzo Chrome Brown B—(IG)	100
Benzo Fast Black L—(IG)	750
Benzo Fast Bordeaux 6BL—(IG)	100
Benzo Fast Brown 3GL—(IG)	1,000
Benzo Fast Brown RL—(IG)	600
Benzo Fast Heliotrope 5RH—(By)	
Benzo Fast Heliotrope 5RH—(IG)	270
Benzo Fast Yellow RL—(IG)	400
Benzo Rhoduline Red B—(IG)	150
Benzo Rhoduline Red 3B—(IG)	200
Brilliant Benzo Fast Yellow GL—(IG)	300
Brilliant Benzo Green B—(IG)	100
Brilliant Congo Blue 5R—(IG)	126
Brilliant Pure Yellow 6G Extra—(By)	
Brilliant Pure Yellow 6G Extra—(IG)	746
Brilliant Sky Blue 8G Extra—(By)	
Brilliant Sky Blue 8G Extra—(IG)	1,112
Brilliant Sky Blue 2RM—(IG)	3,200
Chlorantine Brown Y—(I)	220
Chlorantine Fast Blue 2GL—(I)	2,204
Chlorantine Fast Blue 4GL—(I)	1,212
Chlorantine Fast Blue 8GL—(I)	3,638
Chlorantine Fast Brown BRL—(I)	220
Chlorantine Fast Gray B—(I)	882
Chlorantine Fast Green B—(I)	1,102
Chlorantine Fast Violet 5BL—(I)	1,763
Cotton Fast Yellow RL—(By)	220
Diamine Azo Fast Violet R—(C)	551
Diamine Brilliant Scarlet S—(C)	
Diamine Brilliant Scarlet S—(IG)	2,774
Diamine Fast Bordeaux 6BS—(IG)	200
Diamine Fast Brown R—(IG)	300

Name of Dye and Manufacturer	Quantity (pounds)
Diamine Fast Orange EG—(IG)	500
Diamine Fast Orange ER—(C)	
Diamine Fast Orange ER—(IG)	957
Diamine Fast Scarlet 8BS—(IG)	100
Diaminogen Blue GG Powder—(C)	550
Diazo Brilliant Green 3G—(By)	
Diazo Brilliant Green 3G—(IG)	951
Diazo Brown 6G—(By)	
Diazo Brown 6G—(IG)	531
Diazo Brown 3R—(IG)	200
Diazo Fast Violet BL—(IG)	300
Diazo Indigo Blue 4GL Extra—(IG)	496
Diazo Indigo Blue 2RL—(IG)	300
Diazo Rubine B—(By)	551
Diazo Sky Blue B—(IG)	200
Daizo Sky Blue 3G—(IG)	441
Diazo Sky Blue 3GL—(IG)	
Diazo Sky Blue 3GL—(By)	1,151
Direct Ago Green 3G—(By)	551
Direct Fast Blue 8GL—(By)	440
Direct Light Blue 8G—(By)	1,210
Direct Sky Blue 8G—(By)	1,100
Fast Cotton Gray VL—(IG)	2,000
Fast Cotton Brown 4RL—(IG)	100
Half Wool Blue 3R—(IG)	500
Naphthogene Blue B Powder—(A)	457
New Claret RX—(IG)	50
Minaxo Blue 4BX—(IG)	200
Parsulphon Brown V—(S)	350
Triazol Fast Brown 3GL Powder—(GrE)	440
Triazol Light Orange 2RL—(GrE)	288
Dyes for Artificial Silk	
Azonine Direct Violet R Conc. Paste—(IG)	25
Cellit Fast Red B—(IG)	50
Duranol Black Paste—(BDC)	1,000
Duranol Orange G Paste—(BDC)	162
Duranol Red BB Paste—(BDC)	318
Duranol Red G Paste—(BDC)	374
Ionamine A—(BDC)	50
Orange Extra Paste—(IG)	100
Setacyl Direct Blue R Powder—(G)	220
Rapid Fast Dyes	
Rapid Fast Pink LB Paste—(IG)	200
Rapid Fast Red LB Paste—(IG)	200
Rapid Fast Red GL Paste—(IG)	900
Basic Dyes	
Rhodamine 6GH Extra—(S)	1,000
Rhodamine 6GDN Extra—(IG)	4,000
Sulphur Dyes	
Indo Carbon CL—(IG)	2,500
Indo Carbon SN—(IG)	1,500
Sulphide Violet RR Conc.—(IG)	50
Thionol Brown O—(BDC)	2,240
Thionol Brown CL4R—(BDC)	100
Thionol Green B—(BDC)	6,354
Color-Lake and Spirit-Soluble Dyes	
Alizarine Astrol (Oil Soluble)—(IG)	300
Hansa Yellow G Transparent Paste—(IG)	800
Hansa Yellow GSA Powder—(IG)	5,000
Hansa Yellow 5G Powder—(IG)	300
Helio Bordeaux BL Paste—(IG)	924
Helio Fast Pink RL Paste—(IG)	100
Helio Fast Rubine 4BL—(IG)	400
Helio Red RMT Extra Powder—(IG)	200
Lake Yellow G Powder—(M)	407
Nitrazol CF—(IG)	100
Oil Red—(Q)	60
Oil Vermillion—(Q)	60
Paper Fast Bordeaux B—(IG)	1,300
Spirit Blue—(Q)	60
Tero Black FB—(IG)	100
Tero Brown FR—(IG)	50
Tero Red FG—(IG)	50
Unclassified Dyes	
Ink Fast Black A Extra—(IG)	100
Violet Red HR—(St.D)	55
Very Superior Pink AA—(Q)	25
All Other—(Q)	2

FOUR NEW COLORS IN NATIONAL RANGE

Four new dyestuffs of different types have recently been developed and placed on the market by National Aniline & Chemical Company under the names of National Alizarine Cyanine Green G Extra, Erie Fast Rubine B Conc., Erie Yellow S2G Conc. and Alizarol Brown EB.

The Alizarine Cyanine is an Acid Green of bluish tone described as possessing all-round fastness and suitability for use as an acid as well as a chrome dye. It may be applied by all three methods usually employed for mordant dyes, producing tone slightly duller than the self-shade, but, according to the announcement, of better fastness to washing, potting and milling. It is said to dye well in an neutral bath, staining cotton but slightly and dyeing wool and silk practically the same shade. It is suitable for wool in all forms, including vigoreaux printing.

The Erie Fast Rubine B Conc. is said to be characterized by good solubility and inertness to metals, being therefore adapted for application in all types of machines. It is particularly recommended for unions, says the announcement, dyeing the cotton almost to the exclusion of the wool; in a soap-soda ash bath silk is left unstained. It is claimed to be of special interest to the printing trade because of its easy dischargeability.

The second new Erie color, Erie Yellow S2G Conc., is described as of interest to dyers of cotton and other vegetable fibers and as having practically no affinity for animal fibers. It is recommended for securing white silk effects, and the description further states that it possesses good solubility, dyes level and exhausts well. In shade it is slightly greener and brighter than this manufacturer's Erie Yellow F.

The fourth color, National Alizarol Brown EB, is a wool color, said to be especially valuable on account of its dyeing properties by the ortho-chrome process. It is described as useful for the production of browns, tans, olives, etc., either as a self-color or in combination with other members of the same group.

Technical Notes from Foreign Sources

Printing with Basic Dyestuffs

When printing with basic dyestuffs the latter are employed in the form of their free bases, or of the leuco compounds of the free bases, in conjunction with the following mordants: Diamine and sulphur dyestuffs, and the products obtained on heating phenols or aromatic amines and their derivatives in alkaline sulphur melts. The following are examples of compositions for printing on white or naphtholated goods.

Rhodamine B, Setoglaucine, Thionine Blue GO or Fuchsin GR (dissolved in hot water together with tragacanth, and neutralized or rendered slightly alkaline with soda lye), Katanol, Alizarine Oil, and in some cases hydrosulphite. For resists printing with Aniline Black and other oxidation colors, the following are examples: Saffranine, Rhodamine B, Thionine Blue GO, Setoglaucine or Auramine O, Tragacanth, soda lye, potassium sulphite, Alizarine Oil, Katanol, and in some cases hydrosulphite and zinc oxide.

For hydrosulphite discharge style the following are examples: Rhodamine B or Auramine O, tragacanth, soda lye, hydrosulphite, Alizarine Oil and Katanol. When using diamine and sulphur dyestuffs as mordants, these are dissolved in the thickening, sufficient lye being added to render the mass alkaline. In a second portion of the thickening the basic dyestuff is dissolved, and sufficient lye added to form the free base. After printing, the lake is fixed by steaming and passage through acid. As typical pairs of solutions the following are examples: (a) Diamine Blue FF, soda lye, and thickening and (b) Methyl Violet 5R, soda lye, and thickening, and (a) Sulphur Green, hydrosulphite, soda lye and thickening and (b) Brilliant Green, soda lye and thickening. (British Patent No. 262,850.)

Acetate Silk

Cotton linters are preferred as raw material not on account of their superior molecular aggregate, which is artificially lowered in the subsequent operations, but because of their freedom from beta-cellulose, etc., which tend to render the product harsh and horny. Wood pulps are used in minor quantities, but only after treatment for the removal of inferior cellulose constituents. The acetylation is essentially a heterogeneous reaction because the distribution and diffusion of the acetylating agent is not rapid and uniform throughout the process, and the primary acetate is not homogeneous. This drawback is largely corrected in the secondary treatment.

The size of the molecular aggregate is considerably reduced, and higher dispersion insured during this secondary reaction, and the acetyl valve is also reduced, that is, free hydroxyls are developed. Owing to these differences the solubility is modified and greater chemical homogeneity is obtained. The secondary acetate is far more responsive to plastifying agents than the primary, but no ideal plastifier, such as camphor with nitrocellulose, is known. The solution in acetone, etc., is ready for spinning as soon as it is prepared. There is no secondary change in aggregation of the nature of "ripening."

Both dry and wet spinning processes are practised with recovery of solvents. The dry process has the advantage of yielding directly and rapidly a strong, well-constructed thread (good Roentgen diagram of regenerated cellulose). In wet spinning quick coagulation gives poor threads; the best results are obtained by the "stretch" spinning process wherein the filaments are gradually coagulated and drawn out from relatively large orifices. The thread is water-repellent, and special adsorption methods of dyeing have been developed. Acetate silk possesses very special characters of luster and handle. (Papierfabrikant, 1927, Vol. 25, pp. 17 to 18.)

Turkey Red Dyeing on a Large Scale

Turkey Red is a color that has been known for a long time, and in spite of the advance that has been made in the dyestuff manufacturing and in the dyeing industry as well, it is still unsurpassed as a cheap red dyestuff, which gives shades that are fast to bucking, bleaching and light. It should be mentioned that there is no field of dyeing in which the finishing operations require so much attention and time as in Turkey Red dyeing. The many handlings of the material and its drying make the process time-consuming.

The dyeing method employed in the Turkey Red dyeing is as follows: The cotton yarn is introduced into the dye vessel and is boiled with 3 per cent of calcined soda for a period of two and one-half hours at a pressure of 1½ atmospheres. After the yarn has been washed on the washing machine, it is centrifuged and dried. The yarn is either hung on racks in the drying chambers or they are dried, in order to increase the production, in channel driers or other apparatus of recent design. A temperature of 50 to 60 deg. Cent. is constantly maintained in the drying chambers. Complete drying of the goods is of considerable importance.

After drying the goods are treated with oils or liquored. Olive oil or sulphonated castor oil of first pressing, which means Turkey Red oil, are suitable for this purpose. The required quantity of oil is emulsified, this being accomplished by treating approximately 8 to 12 liters with a 4 deg. Be. solution of potash. A portion of the yarn, about 600 pounds in weight, is first treated with the oils. Two of the regular, double-agitator liquoring machines are joined together, so that two men are required for the

operation of four machines. The yarn is passed through the machine and wound up and then dried.

Four to six batches are treated with the oil in this manner. For the second and third passage through the oil, other machines are required as well as attendant labor. The yarn is dried each time. It is to be assumed that the operating personnel must be of a high character, for at times from 4,000 to 6,000 pounds of cotton yarn are dyed daily.

After the third passage through the oil, the dry yarn is subjected to the first lye treatment in a vat containing a solution of potash, ¼ deg. Be. in strength. The yarn is allowed to remain in this solution for a period of three hours at a temperature of 30 deg. Cent. Then it is removed from the vat, centrifuged and allowed to dry at a temperature of 60 deg. Cent. The yarn is then treated with the liquor for the second time by allowing it to remain for two hours in water at a temperature of 30 deg. Cent. After the yarn has been well centrifuged, it is treated in the mordanting machine with a strong sumac or tannin liquor, the treatment being repeated twice at a temperature of 40 deg. Cent. Then it is well wound up.

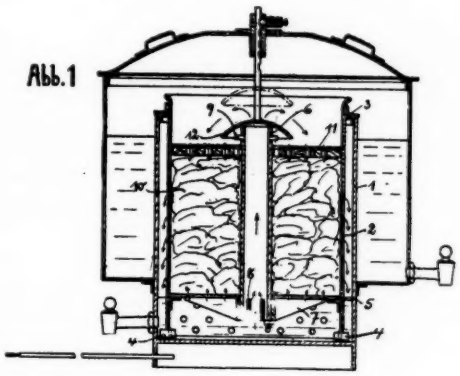
The mordanting is then completed with aluminum acetate or aluminum sulphate of 5 deg. Be. concentration. The yarn is allowed to remain in this solution for a period of several hours or overnight or even several days. After its removal from the alumina salt liquor, it is washed twice on a washing machine.

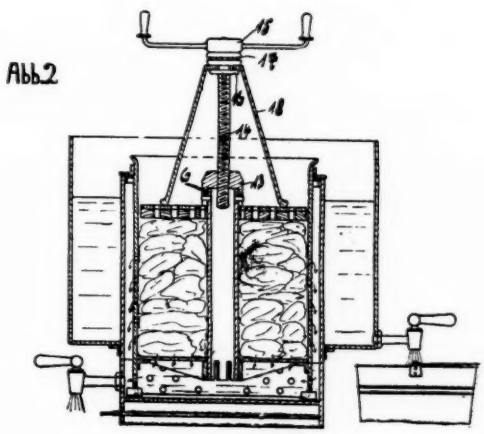
The yarn is then ready for dyeing and is placed on laths, about 3 pounds on a lath. Two hundred grams of blood albumen and 5 to 8 kilograms of Alizarin are added to the dye vessel. The Alizarin is screened through a sieve, whether the yarn being dyed is warp or filling, soft or hard. Ten kettles and twenty workers are required for the production of 5,000 pounds of yarn a day. The yarn is dipped into the liquor once and then worked around rapidly 18 to 25 times. After the first dye treatment the goods are so heated with indirect steam that the temperature gradually rises to the boiling point within an approximate period of one and one-half hours. Then the liquor is slowly heated, the yarns are worked around every ten minutes and the liquor allowed to run off. The yarns are then hung up on racks.

The red yarns of the first batch are then removed and thrown into a kettle wherein they are boiled for a period of two hours at a pressure of one-half to three-quarters of an atmosphere with a strong soap liquor and a little potash solution. This is followed by a second boiling wherein a little tin salt is added, and when necessary the yarn is cooked for a longer period. After boiling and brightening the yarn is well washed twice on the washing machine and then centrifuged, sized or starched, weighted and finally dried. (Deutsche Faerber Zeitung, 1927, pp. 269 to 270.)

Washing and Wringing Machine

The machine shown in the accompanying illustration is patented in German Patent No. 433,347. It is so constructed that after the completion of the washing operation the cover of the vessel is removed and the vertical standpipe is connected with a wringing device. Fig. 1 shows the arrangement when used for boiling fabrics, and Fig. 2 shows the arrangement for wringing the washed fabrics. The essential features of the machine can be readily seen from these figures.





The steam vapors rise through the holes in the bottom plate 5, passing through the fabric, and later boiling water is poured over the fabric from the top. This constitutes the washing process, and after it is over, the cover is removed and the pipe 6 is connected with a wringing arrangement. This consists of a top piece 13 with a threaded shaft 14 which is worked by means of a hand crank 15. The operation of the wringer is clear without further explanation.

Printing Textiles

White or colored discharge effects are produced on acetyl cellulose materials or materials containing acetyl cellulose by adding sulphocyanides to the usual sodium formaldehyde sulphoxylate discharge printing pastes. Examples are given in which a fabric of cotton and acetyl cellulose is dyed with Chlorazol Fast Orange G and afterwards printed with sodium formaldehyde sulphoxylate, or products containing this substance, dissolved in gum

tragacanth to which is added calcium sulphocyanide. In the second case cellulose acetate is dyed with Ionamine MA, diazotized and developed with beta-naphthol and printed as heretofore. A third example refers to cellulose acetate which is dyed with SRA Orange I and then printed as heretofore. In the fourth example, acetyl cellulose is dyed and printed as in the first example except that Rhodamine 6GDN is added to the discharge printing paste. (British Patent No. 262,254.)

NEW SERVICE MAKES FADING TESTS UNDER CALIFORNIA SUN

A laboratory service for making color fastness tests under steady sun exposure has been established by W. H. Fieldhouse & Co., at 797 Bush Street, San Francisco, Calif. Excellent and rapid results are assured, it is pointed out, since long periods of clear weather are available, and ten, twenty or thirty days' exposure may be made in a month instead of scattered through weeks of dull days.

Exposure racks have been so arranged that various periods of exposure are recorded on each piece of fabric. The tests are made either under glass with access to air or in open air, for material not expected to be subject to the elements when in use, and under glass with free access to air and sea fog for a severe test suitable for overcoatings and similar fabrics. Two testing stations, one on the coast and one inland, make this procedure possible.

Ciba Company, Inc., announce the appointment of Arthur T. Brainerd as manager of the Chicago office of this company. Mr. Brainerd assumed his duties at 233 West Huron Street, on May 1.

Owen M. Voigt sails on the Majestic Friday, May 13, for a two months' visit to England, France, Germany and Spain, in the interests of the Herrick & Voigt Company. Mr. Voigt is making the trip with the aim of acquainting himself with the latest finishing products developed abroad.

T. R. Johnson, who read a paper at the meeting of the American Chemical Society, Division of Dye Chemistry, on the subject of "Application of Vat Dyes in Package Type Machines," is a graduate in Textile Chemistry and Dyeing of the North Carolina College Textile School, and is textile chemist at the Southern Franklin Process Company, Greenville, S. C.

W. C. Dodson, who has been sales engineer for H. G. Mayer Textile Machinery Company, Charlotte, N. C., has been appointed Southern representative of Smith, Drum & Co., Philadelphia, with headquarters in Charlotte. Mr. Dodson is a graduate of the Textile School and is a recognized authority on dyeing and dyeing equipment. He is the author of "Remedies for Dyehouse Troubles," a practical treatise on dyeing operation and dyestuffs.

LOWELL ALUMNI FORMS NEW YORK CHAPTER

More than fifty former students of the Lowell Textile School dined together at the Fraternity Club in New York on Saturday, May 7, and after an interesting business meeting organized a New York Alumni Association.

The honorary guest and speaker of the evening was Prof. Arthur A. Stewart, secretary and treasurer of the L. T. D. Alumni Association, who gave a most inspiring talk on the school and its future work.

The following officers of the New York branch were elected for the ensuing year:

Herbert A. Currier, '06, President.
Arthur J. Hennigan, '06, Vice-President.
George J. Bienstock, '24, Secretary and Treasurer.
Robert R. Sleeper, '00, Trustee.
Howard M. Brigham, '24, Trustee.
Arthur A. Stewart, '00, Honorary Member.

A general forum was held after the dinner, during which many important matters of interest to all L. T. S. Alumni were discussed. One meeting is planned every year. Every L. T. S. man in or about New York City who has attended day courses at least one year is eligible.

Further information may be obtained from the President, H. A. Currier, 25 Madison Avenue, New York City.

The rate for "Position Wanted" advertisements in this column is 2 cents a word—with a minimum of 50 cents per insertion. For all other types of advertisements—i. e., help wanted, machinery or supplies for sale—the rate is $5.00 per column inch or less per insertion.

CHEMIST-DYER

Experienced textile chemist and dyer particularly qualified to carry out installation of application of vat colors to cotton piece goods. Immediately available. Address Box 386, American Dyestuff Reporter.

WANTED

An executive and sales manager by an aggressive company manufacturing a good line of wool and cotton dyes and dyeing specialties. For the man who has a successful record this is an opportunity for the future. Good salary offered. Classified Box 388, American Dyestuff Reporter.

TEXTILE CHEMIST-DYER

Capable worker; technical graduate. Twenty-four years of age. At present employed in large cleaning and dyeing plant in Czecho-Slovakia. Has had both laboratory and selling experience. Knows English, German and Czechian. Address Classified Box 389, American Dyestuff Reporter.